

CHEMICAL ABSTRACTS

Vol. 17.

AUGUST 10, 1923

No. 15

1—APPARATUS

C. G. DERICK

The Redwood viscometer. W. H. HERSHEY. *Bur. Standards, Tech. Papers No. 210, 227-46* (1922).—The most probable equation for the Redwood viscometer is, kinematic viscosity = $0.00280t - (1.88/t)$, where t is the time of flow in seconds. Tables are given for the conversion of Redwood times to Saybolt Universal times or Engler degrees. Unavoidable errors in this type of instrument are so great that changes in the instrumental const. with the temp. are inappreciable. The error due to the inaccuracy of the Meissner formula also is negligible. But the error arising from the cooling of the oil after it leaves the efflux tube may be appreciable at the higher temps.

EUGENE C. BINGHAM

Some factors affecting the accuracy of Saybolt viscosity measurements and their control. P. E. KLOPSTEG AND W. H. STANNARD. *Ind. Eng. Chem.* 15, 702-7 (1923).—One of the A.S.T.M. requirements in detg. the viscosity of lubricating oils by Saybolt's viscometer is that the temp. of the bath must not vary more than $\pm 0.14^\circ$. To meet this, K. and S. have designed a "make and break contact" to be used with a deKhotinsky thermoregulator. The viscometer provided with this control and otherwise designed as described (illustrations) enables the operator to keep the temp. of the bath const. within $\pm 0.03^\circ$ and of the sample within $\pm 0.01^\circ$.

E. G. R. ARDAGH

Viscosity determinations. ROBERT FISCHER. *Z. angew. Chem.* 34, Aufsatzteil, 153-4 (1921).—Improvements are suggested to the author's falling-ball instrument (cf. C. A. 14, 3340) used for technical products such as gelatin and varnish. Conversion factors to Engler units are given.

EUGENE C. BINGHAM

Stalagmometry and viscometry. F.-V. VON HAHN. *Chem.-Ztg.* 47, 402 (1923).—The app. is a further development of Wilhelm Ostwald's viscometer, the change consisting in having the capillary at its lower end not changing gradually into the glass body but slid inside a little ways before fastening. In the space around it a third tube fits, which carries a stopcock at its upper end. The liquid to be examd. is pressed into the ball of the app. with the cock closed, and the time taken to pass it through the capillary, thus giving a measure of the internal friction. The stopcock is next opened full and the liquid drops from the capillary; by estg. the no. of drops from the ball, a measure of the static surface tension is obtained. Curves and data are given showing characteristics of the mixts. paraldehyde-water, a mol. dispersed system, and coagulated white of egg and water, a colloidal dispersed system. The app. gives with simple manipulation very definite curves for the internal friction and surface tension of liquids and gelatinous substances at all temps.

HOWARD E. BATSFORD

Butter- and immersion-refractometers. JOHANNES PRESCHER. *Pharm. Zentral-halle* 64, 251-2 (1923).—A discussion of the essential differences in the 2 types of app. and their application.

W. O. E.

Notes on the Gooch crucible. ARCHIBALD CRAIG. *Chem. Age* (N. Y.) 31, 31-2 (1923).—The importance of rapidly filtering asbestos is emphasized. A modified form of bell-jar for filtering directly into a beaker is described. To enable a pencil to be used for marking crucibles, the surface of the porcelain is roughened by application of a paste of BaSO_4 and HF. For calcg. results of gravimetric analyses, an empirical factor, dependent on the conditions of the detn., should be used instead of the theoretical factor calcd. from at. wts.

DONALD W. MACARDLE

Apparatus for drying by warm air. ALEXANDRE LEGRAND. *Bull. soc. d'encour.* 134, 98-102 (1922).—Cloth or other tissue to be dried is passed between two surfaces, one slightly convex and the other slightly concave, both perforated in such a manner that warm air is passed from the upper convex-surfaced container through the cloth to the lower convex container, which is connected to an exhaust fan. A series of these is used. Among the advantages claimed is that of the possibility of an evenly distributed ox-

idation of mordant or dye in the cloth by means of accurate temp. control of the warm air passing through the cloth. Illustrated. P. D. V. MANNING

Demonstrations in the field of radioactivity. P. LUDRWIG. *Physik. Z.* **24**, 138-41 (1923).—An app. is described for lecture demonstration of the measurement of α , β , and γ radiation. The electroscope and ionization chambers have glass windows, thus allowing visual inspection of the interior parts. D. C. BARDWELL

A screw modification of the Mohr pinch clamps. WM. M. CRAIG. *J. Am. Chem. Soc.* **45**, 1723(1923). E. J. C.

New apparatus for gas analysis. K. A. SCHALLER AND W. BERNDT. *Am. Gas J.* **118**, 491-2, 508(1923).—See *C. A.* **17**, 229. J. L. WILEY

Modified specific-gravity tester. R. B. WAILES. *Gas Age-Record* **51**, 732(1923).—A modified Shilling's effusion app. is described. J. L. WILEY

Steam accumulator. ISMAR GINSBERG. *Chem. Met. Eng.* **28**, 809-10(1923).—The *Ruth* heat or steam accumulator consists of a large tank, 0.9 full of water, thoroughly insulated. This tank is connected with the steam supply of the plant in such a way that by means of pressure regulators, excess steam produced is automatically passed into the accumulator to be drawn off automatically when the supply is less than the demand on the boiler. The absorption of the steam by the water is aided by a special arrangement of app. insuring good contact and thorough circulation. By using such an installation, the boiler plant is built for minimum capacity rather than for max. demand and can hence be constantly operated at full capacity without regard to the load. A test made showed a loss of 2% of steam stored for 3 weeks. The app. has been found of special use in Swedish paper mills. The efficiency of the boiler plant is greatly increased, one plant showing an efficiency of 80% with a fuel saving of 15 to 23%. The largest accumulator so far installed is 5 m. by 19.5 m., holding 345 m.³, the total load being 12,000 kg. of steam. This plant now operates 4 B. & W. boilers each of 393 m.² heating surface fired by 4 men. Previously there were 20 fire-tube boilers fired by 70 men. Present efficiency is 83%. The paper is illustrated. P. D. V. MANNING

An early type of chemical slide rule. J. A. GUNTON. *Ind. Eng. Chem.* **15**, 747 (1923). E. J. C.

Apparatus for removing gases from liquids. L. D. MILLS. *Can.* **231**, 289, May 22, 1923.

Registering device for gas-analysis apparatus. O. RODHE. U. S. **1,458**, 893, June 12.

Evaporator. MASASHI SATO and KOZABURO FUNABASHI. *Japan.* **41**, 422, Jan. 24, 1922. Diagrammatical.

Evaporator. JIRO TAKENAKA and KIYOSHI NONAKA. *Japan.* **41**, 360, Jan. 11, 1922. Diagrammatical.

2—GENERAL AND PHYSICAL CHEMISTRY

GEORGE L. CLARK

William Francis Hillebrand. C. F. WATERS. *Ind. Eng. Chem.* **15**, 752-3(1923).—A brief biography, with portrait. E. J. C.

M. Carey Lea, chemist. 1823-1897. EDGAR F. SMITH. *Catalyst* **8**, No. 6, 7-9 (1923). E. J. C.

W. Nernst. H. v. EULER. *Svensk Kem. Tids.* **33**, 194-8(1921).—An appreciation. Portrait. A. R. R.

Thomas Norton, an alchemist of Bristol. E. J. HOLMYARD. *Chemistry & Industry* **42**, 574-7(1923). E. J. C.

Revision of the atomic weight of boron. Analysis of boron trichloride. O. HÖNIG-SCHMID AND L. BIRCKENBACH. *Ber.* **56B**, 1467-72(1923).—See *C. A.* **16**, 4098. E. J. C.

Is there an element of zero atomic number? F. H. LORING. *Chem. News* **126**, 307-8, 325-6(1923).—Hypothetical consideration of the electron as the origin of the at. no. system. G. L. CLARK

The discovery of hafnium and the present state of our knowledge of this element. GEORG VON HEVESY. *Chem.-Ztg.* **47**, 345-6(1923).—A review. The phosphate reaction of Biltz and Mecklenburg (pptn. of a Zr phosphate from strongly acid soln.), formerly thought characteristic of Zr, is shown in greater degree by Hf; i. e., the phosphate of Hf is the least sol. of all known phosphates. NORRIS F. HALL

Isolation of the oxide of a new element. ALEXANDER SCOTT. *J. Chem. Soc.* **123**,

881-4(1923); cf. *C. A.* 17, 1752.—The prepn. was shown by Coster and Hevesy to contain Fe, Ti, and traces of other elements. The author's detns. of at. wt. were vitiated by analytical errors.

The crystal structure of several oxides. P. NIGGLI. *Z. Krist.* 57, 253-99(1922).—The Debye-Scherrer method was employed in the detn. of the crystal structure. Comparison of Cu, Cu₂O and CuO shows that in all 3, the Cu atom forms a face-centered cubic or pseudocubic lattice. The dimensions are as follows: Cu — $a = b = c = 3.81 \times 10^{-8}$ cm.; $\alpha = \beta = \gamma = 90^\circ$; Cu₂O — $a = b = c = 4.26 \times 10^{-8}$ cm.; $\alpha = \beta = \gamma = 90^\circ$; CuO — $a = 3.74 \times 10^{-8}$ cm.; $b = c = 4.67 \times 10^{-8}$ cm.; $\alpha = 85^\circ 21'$, $\beta = 86^\circ 25'$, $\gamma = 93^\circ 35'$. For tenorite, which crystallizes as triclinic pseudocubic with an approach to the monoclinic system, $a:b:c = 0.8983:1:1$. For Ag₂O, $a = 4.718 \times 10^{-8}$ cm. The distance between Ag atoms = 3.336×10^{-8} cm. and the distance Ag-O = 2.043×10^{-8} cm. The sp. gr. indirectly estd. = 7.798. Ag₂O and CuO possess like structures.

The structure of zinc oxide. L. WEBER. *Z. Krist.* 57, 398-403(1922).—By mathematical treatment, the structure of ZnO is shown to be the same as Bragg and Aminoff found by different methods. It is given through these triple coordinates: Zn = $[\frac{1}{2}, \frac{1}{2}, 0]$, $[\frac{1}{2}, \frac{2}{3}, \frac{1}{3}]$; O = $[\frac{2}{3}, \frac{1}{3}, \frac{2}{3}]$, $[\frac{1}{3}, \frac{2}{3}, \frac{1}{3}]$.

The effect of drawing on the crystal structure of tungsten wires. P. L. SIEG. *Proc. Iowa Acad. Sci.* 28, 95-7(1921).—As a result of tests on the coeff. of rigidity of drawn W wires and subsequent examinations involving a photomicrographic study of sections of the wires, it has been demonstrated that drawing has an effect on the crystal structure near the surface which is distinctly different from the effect deeper in the structure of the wires. This accounts for the progressive changes in the elastic consts. of the wires.

Crystalline structure of anthracene. W. H. BRAGG. *Proc. Phys. Soc. London* 35, 167-9(1923).—Data obtained from small but perfect crystals agree very closely with the hypothesis advanced previously (cf. *C. A.* 16, 2504) that the benzene ring has an actual structure of ascertainable size and form, and that consequently the unit cells of naphthalene and anthracene should have two of their axes equal, and the third axis for anthracene should be longer than that for naphthalene by the width of one benzene ring or 2.5×10^{-8} cm. The d , of anthracene crystals was found to be 1.255. X-ray data furnish a new and accurate method of detg. the d , of a crystal.

Molecular and crystal symmetry. J. W. EVANS. *Nature* 111, 740(1923).—Remarks upon the paper by Barker (*C. A.* 17, 2375) discussing the Federov-Shearer theory with reference to the relations between mol. and crystal symmetry. In the case where mols. retain their identity in the structure of the crystal they may not retain their full symmetry in the close-packing. Furthermore the symmetry actually possessed by the unit cell may not be identical with that of the structure of which it forms a part because of cell-twinning and the tendency of cells of low symmetry to build up structures of higher symmetry, usually belonging to the same system. G. SHEARER AND W. T. ASHBURY. *Ibid* 740-1.—Reply to criticisms by Barker (*C. A.* 17, 2375) of "Shearer's rules" and of Ashbury's interpretation of the structure of tartaric acid in support of these rules.

Supposed relations between atomic constants and the valence number of the atom. WALTER HÜCKEL. *Z. physik. Chem.* 104, 262-8(1923).—It is shown that the function $\varphi = (\text{mol. additive property})/(\text{valence sum})$ is, within wide limits, very generally almost independent of the numerical proportion of the at. consts., as well as of the nature of the compds. If φ is an exact const., it follows that the at. consts. behave like the valence nos.; but if φ is only approx. const., no conclusion can be drawn. Those relations between at. vol., at. refraction, and at. cohesion on the one hand and valence nos. on the other, which are found in the literature and which rest only on this basis, do not really exist.

The coefficient of simple rigidity and Young's modulus for hexagonal crystals of selenium. L. P. SIEG AND R. F. MILLER. *Proc. Iowa Acad. Sci.* 28, 103-11(1921).—Results of the detn. of the simple rigidity and of Young's modulus for some Se crystals are reported.

Molecular weight of water. P. N. CHIRVINSKII. *Bull. soc. russe des amis de l'étude de l'univers, Petrograd* 7, 6-10(1918); *Mineralog. Abstracts* 2, 13.—The conclusion is drawn that in liquid water the mol. is (H₂O)₂ and in ice (H₂O)₃. The space lattice of ice is discussed.

Molecular refraction and molecular volume of aromatic nitro compounds. J. D. JANSEN. *Chem. Weekblad* 20, 260-1(1923).—Regular differences exist in the sp. vols. of solns. of compds. which differ from each other with respect to one group; e. g., if H is

replaced by NO_2 the sp. vol. decreases 0.0075. This is important for calcg. the mol. refraction of mixts. R. BEUTNER

The colors of inorganic compounds. WILHELM BILTZ. *Z. anorg. allgem. Chem.* 127, 169-86, 372(1923).—A survey is made of mixed compds. contg. the same elements with differing valence (e. g., $\text{NO}.\text{NO}_2$), mixed compds. with different elements (e. g., $\text{HCl}.\text{AlCl}_3$), org. compds., magnetism in inorg. compds., cond., "sub" valent (e. g., CaCl) and "super" valent (e. g., H_2O_2) compds., metallic series with progressively changing valence (e. g., MnO , Mn_2O_3 , Mn_3O_4 , MnO_2), the effect of heat on color and the stability of inorg. compds. in an attempt to correlate color and phys. and chem. properties. From this the definite and general principle is established that complete satn. of the primary valences of a compd. and a high value for these forces favor transparency in the compd., whereas incomplete satn. and weak valence forces favor the absorption of light, resulting in colored compds. The most extreme case of the first class is the alkali salts; that of the second, the intermetallic compds. such as $\text{CoO}.\text{ZnO}$. C. C. D.

Surface tension, surface energy, and latent heat. JOHN SATTERLY. *Trans. Roy. Soc. Canada* 16, III, 83-92(1922).—This is a crit. discussion of papers on this subject by Waterston in 1858 and later workers. F. L. BROWNE

Surface and boundary junction tensions. J. A. VERHOEFF. *Chem. Weekblad* 20, 255-6(1923).—Polemical with Carrière (*C. A.* 17, 2071) over the relative accuracies of the static and the droplet surface tension methods. R. BEUTNER

A value for the surface tension of iron sulfide. E. J. L. HOLMAN. *J. Iron Steel Inst.* (advance proof) 6 pp.(May, 1923).—The method used is a modification of the drop method; it consists in pouring the metal on to a flat surface and measuring the thickness of the plate. The surface tension (T) of a metal at a high temp. near its f. p. can then be calcd. by means of the equation $T = g.d.h^2/4$, where T is the surface tension in dynes per sq. cm., g is 981, d the density of the metal and h the thickness of the plate. The values for the surface tension of 5 metals (Sn , Pb , Zn , Cu , Al) were detd. by melting 800 g. of the metal and pouring at a temp. 20% above its m. p. on to a smooth iron surface. The values obtained for these metals were somewhat lower than the accepted values. The value for FeS was 494.4 (dynes per sq. cm.). The low value for the surface tension of FeS must have an important bearing on the question of the diffusion of FeS in Fe and its effect on iron carbide. L. T. FAIRHALL

Stability of alcohol-petroleum ether mixtures in the presence of water. M. AUBERT AND G. DIXMIER. *Compt. rend.* 176, 1307-10(1923).—Since the addn. of H_2O above a certain limit causes EtOH -petroleum ether mixts. to sep. into 2 layers, the effect of adding at 0° and 15° up to 400 cc. of H_2O to a l. mixt. (varying from 90 petroleum ether: 10 EtOH to 20 petroleum ether: 80 EtOH) has been studied. Mixts. contg. EtOH denatured with 5% MeOH are more stable toward addns. of H_2O . B. S. N.

Further investigations of swelling crystals. J. R. KATZ. *Verslag Akad. Wetenschappen Amsterdam* 31, 333-7(1922).—In a previous paper (*C. A.* 5, 3533) and in a dissertation (*Die Gesetze der Quellung*, Amsterdam, 1917), K. showed that the quotient $(C/W)i = 0$ (C = vol. contraction in cc., W = the heat of imbibition in cal., i = no. of g. H_2O absorbed by 1 g. of the dry substance) is of the same order for a no. of amorphous substances such as casein, nuclein, inulin, and wood fibers, and also for such liquids as H_2SO_4 , H_3PO_4 , and glycerol. Values of the same order are presented for crystals of cdestin and amyloextrin. The same laws govern the swelling of amorphous and cryst. solids. These investigations indicate important, but as yet unknown, principles of mol. attraction. A. P. H. TRIVELLI

Absorption of gases by solids and the thickness of the adsorbed layer. M. H. EVANS AND H. J. GEORGE. *Proc. Roy. Soc. (London)* 103A, 190-3(1923).—E. and G. detd. from Muller's data (*Ann. Physik* 3, 328(1900)) and the relative adsorption of gases by powd. glass, the no. of mol. layers of CO_2 adsorbed by the glass to be 5.5, and calcd. the number of mol. layers for other gases to be: SO_2 , 32.1; NH_3 , 39.9; N_2O , 4.5; C_2H_2 , 3.5. In the cases of these gases the forces of mol. attraction exerted by the glass surface extend to distances considerably greater than the diam. of a mol. This contradicts Langmuir's generalization that the forces which bind mols. to the surface cannot extend to a greater distance from the surface than the diam. of a mol. The expts. on which this generalization is based were conducted with gases at pressures no greater than 86 bars (0.645 mm. Hg). I. NEWTON KUGELMASS

Contributions to general colloid chemistry. V. The relationship between constitution and stability of ferric oxide sols. WOLFGANG PAULI AND GEORG WALTER. *Kolloidchem. Beihefte* 17, 256-93(1923).—Physico-chem. analysis of continuously dialyzed Fe_2O_3 sols shows an increasing accumulation of $\text{Fe}(\text{OH})_3$ groups about the individual

particles. The max. no. aggregating about a unit charge is about 140. The no. of aggregates per cc. (s) may be calcd. from the equation $z = N_{Cl}/1000$, where c_{Cl} is the potentiometrically measured Cl-ion concn. and N is the Avogadro no. The av. diam. of the particles may be calcd. from the equation: $d = 2\sqrt{3M/4\pi SN}$, where M is the mol. wt. On diln. the complexes are somewhat decreased. The calcd. degree of dissociation ($\alpha = C_{Cl}/n_{Cl}$ where n_{Cl} is the total Cl normality) gradually increases with diln. and at higher dilns. is the same for the same sol dialyzed for different periods of time, provided the total Cl is the same for all. The changes due to ageing and diln. yielding abnormal rise in colloidal ion mobility and increase in equiv. cond. (K/n_{Cl} where K is the total cond.) may all be attributed to increased ion concn. The longer a sol is dialyzed the less the tendency for ionic increase. Addn. of sulfate ions to the sol coalesces it by formation of insol. compds. or rather complex double salts or chlorosulfates whose SO_4 content is in abundance. The ratio $Cl:SO_4$ is an inverse function of particle size. With increasing no. of $Fe(OH)_3$ groups about the aggregates there is a corresponding linear decrease in flocculation optimum and in Cl replaceability. Flocculation of the sol by NaCl is due to repressed dissociation. The sol, so coalesced, is characterized by wide ranges of flocculation optima and the transformability of the coalesced sol into a stable dispersoid which becomes turbid on diln. VI. Analysis and constitution of colloidal gold. ERNA KAUTZKY AND WOLFGANG PAULI. *Ibid* 294-312.—A review of the work on the analysis, structure and source of elec. charge and color of Au sols. Analysis yielded a percentage compn. equiv. to that of $AuCl_3 \cdot 2H_2O$; from the method of prepn. it may be considered to be of the structure $[Au^{+++}Cl_4Au^+Cl_2]H_2$, or expressed

according to the Nernst concept $\left[\begin{smallmatrix} \ominus & Au^{+++} & \ominus \\ \ominus & & \ominus \end{smallmatrix} \right] Au^+$. The color transition of the Au sol

from red-blue is not a simple function of the degree of dispersion, for Au sols may be so prepd. as to give no color change on coalescence.

I. NEWTON KUGELMASS
Borax melts with gold particles of graded size and their application to testing Smoluchowski's coagulation theory. A. EHRRINGHAUS AND R. WINTGEN. *Z. physik. Chem.* 104, 301-14 (1923).—Borax glasses have been prepd. which contain finely divided Au in particles of graded size, and the prepn. examd. with the ultramicroscope. The no. of particles contained in a borax glass increases with the time of heating. This is in agreement with Smoluchowski's theory of rapid coagulation (cf. *C. A.* 11, 735, 3140), which has hitherto been confirmed only in the case of hydrosols. In borax glasses the particles combine to form larger ones only when they approach closely to one another in consequence of the Brownian movement. At 1000° the d. of borax = 2.04; its viscosity is 3.38 at this temp. and 13.61 at 890° .

H. JERMAIN CREIGHTON
Elasticity of sols and gels. H. FREUNDLICH AND W. SEIFRIZ. *Z. physik. Chem.* 104, 233-61 (1923).—A procedure is described for the relative measurement of the elastic modulus and elastic limit of sols and gels. This is based on the withdrawal by a magnet of a Ni particle (18 μ diam.) that is suspended in the sol or gel. Aq. colloidal solns. of gelatin, soap, white of egg, V_2O_5 , $Fe(OH)_3$ and benzopurpurin, a soln. of para gum in C_4H_8 , a satd. aq. soln. of sugar, and glycerol have been studied. The elasticity of gelatin (Kahlbaum) solns. increases rapidly and steadily with the concn. of gelatin. The elastic limit of these solns. exhibits a max. at 0.8% gelatin. Different sorts of gelatin are markedly different in their elastic properties. Gelatin sols and gels have a higher elasticity at the surface than in the interior. The cause of this is probably associated with surface tension. The elastic properties of Na stearate are similar to those of gelatin, while white of egg has an especially high elastic limit. An aged V_2O_5 sol and a benzopurpurin sol contg. $BaCl_2$ were not as elastic as an aged Fe_2O_3 sol. The 2 former were double refracting; the latter was not. A concd. soln. of para gum in C_4H_8 is elastic only at its surface. Glycerol and a satd. aq. sugar soln. are wholly non-elastic. The elastic displacement, Δ , of a Ni particle and its distance, r , from the magnet tip are connected by the expression $\Delta r^2 = \text{const.}$, where the size of the particle is const. The value of $1/\Delta r^2$ is a measure of the elastic modulus. For gelatin solns. this increases rapidly and steadily with the gelatin concn. If a is the radius of the Ni particle, the ratio $a^2/\Delta r^2$ is fairly const.

H. JERMAIN CREIGHTON
The action of tannins on hydrophil colloids. H. G. BUNGENBERG DE JONG. *Chem. Weekblad* 20, 260 (1923).—Cataphoresis expts. prove that tannin is not a negatively charged colloid; the pptn. of gelatin cannot be, therefore, an elec. neutralization. Pure gelatin or pure agar-agar is not pptd. by tannin, which merely dehydrates the colloidal particles. Pptn., however, occurs if traces of salts are added, which decrease the elec. charge of particles. Dehydration and neutralization of the elec. charge must be combined in order to produce pptn.

R. BRUTNER

Deformation of gels by the action of an electric current. FELIX MICHAUD. *Compt. rend.* 176, 1217-9(1923).—If a hot concd. gelose soln. is poured into a cell between metal electrodes and cooled, a stiff gel results. When an elec. current is passed through the cell, the part of the gel near the anode shrinks, and that near the cathode swells and exudes moisture. Gelatin gels show a similar behavior but to a smaller degree. Strips of gelose either alone or supported by a skeleton of Cu or Ag filaments showed a marked contraction when attached to an anode and a marked expansion when attached to a cathode. M. ascribes this action to the changes effected in the elec. double layer which covers the walls of the fine filament-like cavities of the gel. The elec. current as well as H-ion concn. causes swelling by this means. The contraction of muscles may be explained on this basis. F. E. BROWN

Moisture relations of colloids. I. Comparative study of the rates of evaporation of water from wool, sand and clay. E. A. FISHER. *Proc. Roy. Soc. (London)* 103A, 139-61(1923).—A comparative study is made (1) of the rates of evapn. of water from wool fabric (wholly colloidal with a cellular structure) quartz sand (wholly non-colloidal with a granular structure), silty soil (very feeble in colloidal properties), and heavy clay subsoil (typically colloidal), and (2) of the factors affecting the rates of evapn. The curves obtained by plotting rates of evapn. against water content are discontinuous and different from the corresponding smooth vapor-pressure curves. Each portion of the rate curve can be expressed by a simple type of equation connecting rate of evapn. with water content. The rate curves are similar in type. The forces holding the water are similar in all cases. A colloid as such has no characteristic rate-of-evapn. curve. It is only when certain physico-chem. factors are operative, as in gelatin, that the simple type of evapn. curve is not followed. The shrinkage of clay has a characteristic effect on the curve, which may be allowed for in the equation of rate. This effect is absent in wool, sand and silt; hence the so-called *shrinkage of wool* on drying is really a deformation and not a vol. shrinkage. The absorption of water by wool is attributed to a filling up of fine pores of various shapes and sizes. The vapor pressures of wool-water systems are detd. by the diam. of the pores that are full of water. I. NEWTON KUGELMASS

Piezoechemical studies. XVIII. General direct procedure for the determination of solubility at high pressures. E. COHEN, D. H. PERKEBOOM VOLLER AND A. I. TH. MOESVELD. *Z. physik. Chem.* 104, 323-31(1923); cf. *C. A.* 17, 1913.—A procedure is described for the detn. of soly. at high pressures with the same accuracy as at atm. pressure. The original should be consulted for details. H. JERMAIN CREIGHTON

A lecture-table demonstration of solubilities, or of indicator action. R. W. THATCHER. *J. Am. Chem. Soc.* 45, 1471(1923).—Make alk. an aq. soln. of azolitmin, litmus or any anthocyan pigment sol. in its acid form in AmOH, add an equal vol. of AmOH, shake and let sep. The pigment appears only in the H₂O layer. Acidify, shake and let sep. The pigment appears only in the AmOH. When exactly neutral, the pigment appears in its acid and alk. colors in the AmOH and H₂O, resp. C. C. DAVIS

The refraction volumes of very dilute solutions. C. DIETERICI. *Ann. Physik* 70, 558-60(1923).—From the refractive indices of dil. solns. of NaCl and H₂SO₄ a const. value of the optical mol. vol. of these 2 substances was obtained which was the same in value as for concd. solns. NaCl gave 15.86 cc. per mol., and H₂SO₄ 23.00 cc. per mol. A. E. STEARN

The vapor pressures of concentrated sugar solutions. E. P. PERMAN AND H. L. SAUNDERS. *Trans. Faraday Soc.* (advance proof) 1923.—The following give the concn. (g. of sugar in 100 cc.) and the corrected vapor pressure in mm. of Hg at 70° and 90°. At 70°: 11.99, 231.8; 13.53, 233.0; 14.25, 232.0; 16.52, 231.6; 16.99, 232.1; 22.98, 230.8; 23.00, 231.0; 29.67, 228.8; 34.73, 228.4; 40.73, 226.9; 42.26, 226.6; 53.31, 222.0; 59.43, 219.3; 60.70, 219.8; 66.46, 216.0; 68.03, 215.5; 79.31, 207.6; 83.37, 204.8; 87.77, 202.1; 89.56, 199.0; 91.50, 195.3; 90.24, 191.4; 97.17, 188.8. At 90°: 14.43, 523.8; 15.76, 522.6; 20.32, 521.0; 26.04, 517.5; 42.32, 508.1; 45.06, 507.8; 46.17, 507.1; 48.24, 504.3; 54.81, 500.0; 62.80, 492.4; 71.10, 481.5; 75.68, 476.5; 75.77, 474.6; 76.21, 472.3; 78.04, 472.0; 83.61, 458.3; 83.95, 456.2; 87.05, 445.3; 89.66, 442.5; 96.43, 422.4; 100.7, 394.7; 103.6, 385.7. The results give a curve and not the approx. straight line of Perman and Price (*C. A.* 7, 929). Between concns. of 20 and 65 g. per 100 cc. the results are within 0.5 mm. of those calcd. by the formula of Callendar (*C. A.* 2, 2889). No discontinuity occurred in supersatd. solns. Babo's law is shown to hold for sugar solns. up to concns. of 80 g. per 100 cc. The app. is described and illustrated. C. C. DAVIS

Dissociation of strong electrolytes in very dilute solutions. P. GROSS AND O. REDLICH. *Z. physik. Chem.* 104, 315-22(1923).—It is shown mathematically that the cond. data obtained by Washburn and his associates (1911-1918) neither proves nor

disproves the validity of the assumption $c=0 \frac{dK}{dC} = 0$. It is pointed out that a direct exptl. decision is not to be expected.

H. JERMAIN CREIGHTON

Newer aspects of ionization problems. H. TAYLOR. *Trans. Am. Electrochem. Soc.* **43**, (preprint) (1923).—A resumé is given of recent work on energy changes accompanying conversion of some solid cryst. substances and of the hydrogen halides into dissolved ions. The cohesive force of regular crystals is purely elec. in its origin. The electrostatic work necessary to evap. 1 mol. of a crystal into free gaseous ions, is calcd. and checked. By establishing the additivity of heats of hydration, the plausibility of the lattice energy calcns. is enhanced. The concept of lattice energy is applied to the detn. of the electron affinity of halogen atoms. Both the lattice energy calcns. and those based on ionization potentials serve to show the affinity of halogen atoms for electrons is a large positive quantity. There is a decrease in value for the heat of hydration with increase in the size of the ion, but irrespective of the nature of the gas ion, its heat of hydration will be a positive quantity.

A. H. DICK

Ionization of alcohols. R. J. WILLIAMS AND R. W. TRUESDALE. *J. Am. Chem. Soc.* **45**, 1348-53 (1923).—Alcs. should be considered as weak acids rather than as basic substances. Three lines of exptl. evidence support this contention. (1) The equil. in the reaction $C_2H_5OH + NaOH \rightleftharpoons C_2H_5ONa + H_2O$ as measured by a detn. of H_2O present indicates that EtOH is about 8% as highly ionized (into H and C_2H_5O ions) as H_2O . This value lies between the widely varying results of Danner and Hildebrand (*C. A.* **17**, 664), who give 55% by the cond. method and 1% by potential measurements. (2) Considering EtOH as a base in the equil. $EtOH + HCl \rightleftharpoons EtCl + H_2O$, the degree of ionization is one five-hundred-millionth that of EtCl and the latter in turn is so small as practically to defy detection. (3) In the action of MeOH on Mg_3N_2 and on CaH_2 the metal in each case unites with CH_3O and replaces H. The advantages to be gained in org. chemistry from emphasis on the acidic character of alcs. are briefly pointed out.

JAMES M. BELL

Electrolytic dissociation of water in salt solutions. E. LINDE. *Z. Elektrochem.* **29**, 163-8 (1923).—The viscosities of aq. solns. of LiCl and of $CaCl_2$ at 25° have been detd. up to high concns. The results show that the product of the sp. cond. and the viscosity (represented as a function of the % of solute) increases steadily with the concn. The values obtained for the viscosities have been used to correct the values found by Palmer and Melander (cf. *C. A.* **9**, 3154) for the e. m. fs. of H electrodes in aq. solns. of LiCl and $CaCl_2$. The correction is necessary on account of contact p. d. between the solns. employed, due to a difference of their viscosities. The respective H-ion concns. of the different solns. are calcd. by means of the Nernst formula from the corrected e. m. f. values.

H. J. CREIGHTON

Measurement of reaction velocity and the temperature coefficient of reaction velocity. F. O. RICE AND MARTIN KILPATRICK, JR. *J. Am. Chem. Soc.* **45**, 1401-12 (1923).—The errors occurring in the measurement of reaction velocity may be diminished so that the precision measure of a single expt. is 0.20%. For the reaction between acetone and I in dil. aq. soln. catalyzed by HCl the following velocity consts. were obtained: 0°, 0.69944, 0.10%; 24°, 15.187, 0.20%; 25°, 17.148, 0.070%; 27°, 21.609, 0.14%; 35°, 52.840, 0.10%. The velocity const. is the (calcd.) rate of disappearance in moles from a l. of soln. contg. 1 mole of acetone, 1 g. equiv. of HCl, about 0.01 g. equiv. of I, and 0.025 M KI. With HNO_3 at 25° the reaction velocity const. is 17.137, the same as with HCl within the exptl. error. With H_2SO_4 the value is 15.543, about 10% less. A method is developed for detg. the temp. coeff. of a reaction with a high degree of precision by a single expt. Two thermostats at different temps. are used, the same mixt. of the constituents being placed in each. Small corrections are necessary to allow for the time necessary for one sample to acquire the temp. of its bath and also to allow for the change in concn. due to d. changes incident on the change in temp. For the above reaction $k_{25}/k_0 = 24.519$ and $k_{25}/k_{23} = 3.0814$. Substituting these values in the Arrhenius formula $2.3026 \log (k_1/k_2) = (Q/R) \{ (1/T_1) - (1/T_2) \}$ gives Q equal to 20,695 and 20,431, resp. The value of Q therefore diminishes slightly with the temp. Nonelectrolytes, sucrose, glycerol, AcOH, AcOMe, and MeOH have no effect on the temp. coeff. up to concns. of 30%.

JAMES M. BELL

The kinetic investigation of the oxidation of acetaldehyde with hydrogen peroxide, which can be understood as a partial autoxidation reaction. L. REINER. *Z. anorg. allgem. Chem.* **127**, 187-204 (1923).—The relation of the reaction $CH_3CHO + H_2O_2 \rightarrow CH_3COOH + H_2O$ to the autoxidation theory is explained. That pure CH_3CHO and H_2O_2 react with immeasurably slow speed, as found by Haber and Brann, is confirmed. The reaction becomes much faster in the presence of catalyzers, a trace of AcOH

acting as an auto-catalyzer, but the order of the reaction is not definite. The actual course of the reaction does not correspond to a pure auto-catalytic rate. The qual. requirements of a series reaction are fully confirmed and it is concluded that the reaction takes place thus: $2\text{CH}_3\text{COOH} + \text{H}_2\text{O}_2 \longrightarrow (\text{CH}_3\text{COOH}_2\text{O})_2$, and $(\text{CH}_3\text{COOH}_2\text{O})_2 + \text{CH}_3\text{CHO} \longrightarrow 3\text{CH}_3\text{COOH} + \text{H}_2\text{O}$.

E. N. BUNTING

Speed of reaction measurements and calculations. H. v. EULER AND ERIK RUDBERG. *Z. anorg. allgem. Chem.* 127, 244-56(1923).—The degree of salt formation on carbamine and glucoside groups is compared with the stability of the corresponding substances. Exptl. results are given showing the relation between the speed of hydrolysis of acetamide and the acidity of the soln. Similar results are given for cane sugar.

E. N. BUNTING

Velocity of catalytic reactions. Y. S. ZAL'KIND. *Z. physik. Chem.* 104, 177-91 (1923).—The catalytic action of colloidal Pt and Pd black on the addn. of H to derivs. of C_6H_5 has been studied. The derivs. employed were $[\text{Me}_3\text{C}(\text{OH})\text{C}:]_n$, $[\text{Ph}_3\text{C}(\text{OH})\text{C}:]_n$, $[\text{EtMeC}(\text{OH})\text{C}:]_n$ and $\text{PhC}:\text{CH}_2$ alc., Et_2O or mixts. of equal parts of alc. and glycol were used as solvents. The reactions were carried out at 16-18°. The results of the investigation show that the reaction is not, in general, of the 1st order and that its mechanism is complicated, probably because of the formation of intermediate products. The chem. nature of the catalyst undoubtedly plays an important role, the action of Pt differing from that of Pd. The value for the reaction const. of the 1st order increases rapidly. The progress of the reaction is much better expressed by Henri's equation for autocatalysis: $k_1(1 + \epsilon) = (1/t)\ln[(A - \epsilon x)/(A - x)]$, when $\epsilon = 2$. H. J. C.

Water as a catalyst. H. BRERETON BAKER. *Chem. Weekblad* 20, 293-5(1923).—A lecture on the rise of the b. p. of liquids dried by P_2O_5 for a period of several years, the increase of mol. association by careful drying and other similar phenomena.

R. BEUTNER

The necessity of using mercury thermometers with nitrogen filling in the laboratory. S. C. J. OLIVIER. *Chem. Weekblad* 20, 262-3(1923).—In thermometers not filled with N_2 the Hg may distil from the hot to the cold parts, causing appreciable errors in the reading.

R. BEUTNER

Heat of combustion and work of dissociation. III. A. v. WRINBERG. *Ber.* 56B, 463-6(1923).—v. W. discusses various recent calcs. of the heat of combination of C atoms with each other, and allied questions. Different methods agree on about 88 ± 6 cal. for the combination of C-H.

W. P. WHITE

The free energy and heat of formation of zinc iodide. T. J. WEBB. *J. Phys. Chem.* 27, 448-54(1923).—The cell: Zn amalgam, 10%, | ZnI_2 , satd. | Ag has an e. m. f. of 0.39872-0.000094 (T-25°) v., from which the heat of formation of solid ZnI_2 was calcd. to be 49900 cal. Direct detns., dissolving Zn powder in water by means of free I (with probable error of 5 per mille), gave 48800 cal.

W. P. WHITE

The heat of solution of thallium in dilute thallium amalgams. T. W. RICHARDS AND C. P. SMYTH. *J. Am. Chem. Soc.* 45, 1455-60.—The app. was a slight modification of one previously described (*C. A.* 13, 3058). Electrolytic heating of the adiabatic bath was used, and d. c. with Fe anode was substituted for a. c. to avoid heat produced by inductive action of the a. c. on the conducting mass of Hg. The results agree almost perfectly with those of *C. A.* 13, 3058, and to about 6% with Lewis and Randall's calcd. value for the heat of soln. of Tl in infinite Hg.

W. P. WHITE

The atomic heats of cadmium and tin at low temperatures. W. H. RODEBUSH. *J. Am. Chem. Soc.* 45, 1413-6(1923).—The important region from 70° K. to 100° K. was investigated, with checks at room temp. The app. was similar to that of a former investigation (*C. A.* 12, 782). Important improvements were: (1) The vacuum inclosure was of metal, with soldered lid; the solid thermal connection with the room was thus reduced to a small german-silver tube and the lead wires which it inclosed. (2) The elec. heated metallic case which served as calorimeter jacket was in the vacuum (cf. *C. A.* 17, 669). (3) Great pains were taken with the resistance thermometer standard temp. measurement, which R. holds has been the chief source of error in low-temp. calorimetry. A thermel was used as a more reliable working thermometer. The possible error is conservatively put at a little over 4 per mille. Results agree closely with Lewis and Gibson's curve (*C. A.* 12, 14), and also with direct observations by others, except that Brönsted's values for Sn are shown to be too low.

W. P. WHITE

Heat capacities and entropies of diatomic and polyatomic gases. H. C. UREY. *J. Am. Chem. Soc.* 45, 1445-55(1923).—The entropy const. for diatomic gases with no vibrational energy is calcd. The entropies of H_2 , HF, HCl, HBr, N_2 , CO, and NO are calcd. and agree well with the observed values. Moments of inertia of O_2 , H_2 and Cl_2 are calcd. from their observed entropies. The entropy equation for diatomic

gases having vibrational heat capacity is also considered. From the const. found for the entropy equation of gases whose mols. have tetrahedral symmetry, the dimensions of the methane mol. are calcd. E. N. BUNTING

Equations for vapor pressures and latent heats of vaporization of naphthalene, anthracene, phenanthrene; and anthraquinone. O. A. NELSON AND C. E. SENSEMAN. *Ind. Eng. Chem.* 15, 621-2(1923).—The vapor pressures of these compds. are calcd. from the Clapeyron equation and agree closely with the observed values. The entropy of vaporization of these compds. is also calcd. and indicates that all form normal liquids.

E. N. B.

Chemical constants of saturation equations. E. WERTHEIMER. *Z. physik. Chem.* 104, 203-32(1923).—A mathematical paper devoted to the study of the 2 chem. consts. of the thermodynamic functions, the entropy const. a and the energy const. b .

H. JERMAIN CREIGHTON

• Eutectic points of salt solutions. P. MONDAIN-MONVAL. *Compt. rend.* 176, 1313-6(1923); cf. *C. A.* 17, 2222.—LeChatelier's theorem (*Compt. rend.* 130, 1609 (1900)) that $(ds/dt)/(ds'/dt) = Ls/L's'$ in which s and s' are the solubilities of the 2 components of the soln. and L and L' the respective mol. heats of soln. at the eutectic point, was tested by comparing the values of L obtained exptly. with its values calcd. from the exptl. values of the other terms of the equation. For the following salt solns., a good agreement was obtained: NaNO_3 -1.87, NH_4NO_3 -2.97, KNO_3 -6.5, K_2SO_4 -6.6, KCl -3.7, NH_4Cl -3.04.

B. S. NEUBAUSER

The system ammonium nitrate-ammonia. F. HALLA AND K. HIRSCHKO. *Z. anorg. allgem. Chem.* 127, 137-52(1923).—Divers' liquid (formed by passing a stream of NH_3 over NH_4NO_3) was found to form a stable system only at a total NH_3 pressure of 1 atm. and up to a temp. of $23.7 \pm 0.7^\circ$. It is capable of existing above this temp. only in a metastable condition. The system NH_3 - NH_4NO_3 constitutes a simple case of binary heterogeneous equil. The rates of liquefaction of the 4 allotropic forms of NH_4NO_3 were investigated and found not to differ within the limits of exptl. error. L. T. F.

Unsaturation and molecular compound formation. O. MAASS, E. H. BOOMER AND D. M. MORRISON. *J. Am. Chem. Soc.* 45, 1433-8(1923).—The systems α -, m - and p -xylene, propylbenzene and methylcyclohexane, with HBr as the 2nd component, have been examined, f. ps. of mol. % of hydrocarbons from 1 to 100 detd., and mol. compds. shown to exist in the m -xylene and propylbenzene systems. The formation of mol. compds. are due to unsatn.

H. JERMAIN CREIGHTON

The electrochemical behavior of alloys of iron with chromium, iron with molybdenum and iron with aluminium. G. TAMMANN AND E. SOTTER. *Z. anorg. allgem. Chem.* 127, 257-72(1923).—Alloys with 5-10% Cr behave essentially like pure Fe, and those contg. 20% or more Cr like pure Cr. Alloys with more than 15% Cr are passive, and this limit of passivity lies within the series of Fe-rich mixed crystals. Mo alloys show the normal behavior of 2 different noble metals which form a compd. behaving electrochemically like the nobler metal, Mo. After the disappearance of the base structural element (the satd. Fe-rich mixed crystals), Mo-Fe alloys, which consist of an unknown compn. of Mo and an Fe-Mo compd., behave like Mo. Fe-Al alloys with 10% or more Al are passive, because of the formation of a film of oxide. C. C. D.

Electrical conductivity and the constitution of alloys. I. The system lead-thallium. W. GUERTLER AND A. SCHULZE. *Z. physik. Chem.* 104, 269-300(1923).—The resistance has been measured of Pb-Tl alloys, varying in compn. from 0 to 100% Pb, at a number of temps. between 0° and 260° . The resistance-temp. curves indicate that an equil. exists between 135° and 145° . Three series of mixed crystals have been found to exist: (a) crystals of α -Tl with Pb, (b) crystals of β -Tl with Pb and (c) crystals of Pb with a form of Tl not realizable in the free state. No evidence has been obtained of the existence of a compd. PbTl_3 . The temp. coeff. of resistance is given by the expression $dW/dt = A(1 + Bt)$, where A and B are consts. the values of which vary with the compn. of the alloy.

H. JERMAIN CREIGHTON

The thermoelectric power of alloys. H. PELABON. *Compt. rend.* 176, 1305-7 (1923).—For metals with a eutectic structure the thermoelec. power is usually higher than that given by the mixts., rule, e. g., for Sb-Pb the values of e. m. f. against Pt, at 100° in microvolts per degree with those calcd. in parenthesis, are: Pb, 5.14; 8Pb2Sb, 9.27 (14.94); 6Pb4Sb, 11.43 (24.73); 4Pb6Sb, 13.97 (35.52); 2Pb8Sb, 27.92 (41.32); Sb, 54.12. In the liquid state the difference of Pb and Sb is less, at 720° , for Pb, 13; for Sb, 21. But the mean value, 17 microvolts, occurs for 8Sb2Pb. Although Bi is negative its addn. to Sn at first raises the e. m. f. very greatly. (Sn is sol. in solid Bi, but only to 6%. ABSTR.) Following are the values at 150° : Sn, 5.17; 8Sn2Bi, 13.32 (-6.34); 6Sn4Bi, 21.75 (-17.85); 4Sn6Bi, 30.87 (-29.37); 2Sn8Bi, 39.07 (-40.88); Sn9Bi,

—6.04 (—46.64); 2Sn98Bi, —37.14 (—51.35), Bi, —52.4. In the liquid state the thermoelec. power always lies between —13 for Sn and —15 for Bi. It is clear that a max. of thermoelec. power does not indicate a compd. Binary alloys with solid solns. have a thermoelec. power always between the end members. Where there is a compd. there is often a min. of thermoelec. power, but sometimes not, as in Sb and Sn. Sometimes the min. does not coincide with the compd.; e.g., although there is clearly a compd. Sb_2Zn_3 , the min. is at $6\text{Sb}4\text{Zn}$; with the compd. Ag_3Sb the min. is at $2\text{Ag}3\text{Sb}$. But SbCu_3 and Sn_3Al_2 have the min. coinciding. [The numerical results here are in general very different from those of some other observers. The author consistently has his signs wrong, i.e., opposite to the original and generally accepted convention; but he states his convention clearly. The signs are rectified in this abstract. ABSTR.]

W. P. WHITE

Hall effect in thin silver films. J. C. STEINBERG. *Proc. Iowa Acad. Sci.* 28, 115 (1921).—An abstract. Investigation of the Hall effect as a function of thickness in chemically deposited films of Ag ranging from 40 to 200 millimicrons showed the Hall coeff. to be independent of both magnetic field, for fields up to 20,000 gauss, and thickness. The sp. resistance of the same films increases as much as 200% for some of the thinner films. The Hall effect depends primarily upon the mass per unit area, rather than upon the particular manner in which the particles of Ag are deposited, provided that the arrangement is sufficiently irregular to annul the possible effects due to the magnetic field of the atom. Irregularities in the mass per unit area, which are practically unavoidable in the chem. deposition method, account for much of the rather large expl. error. Cf. *C. A.* 17, 1579.

W. G. GAESSLER

Electrometric investigation of the influence of neutral salts on the potential of the hydrogen electrode. V. A. ARKADIEV. *Z. physik. Chem.* 104, 192-202(1923).—The influence of neutral salts on the potential of the H electrode is to increase its value, the increase being proportional to the concn. of the salt. For equiv. concns. of neutral salts, the influence on the potential runs parallel to the tendency of the salts to form hydrates (NaCl , LiCl , LiBr). The influence of KBr and LiBr is more marked than that of KCl and LiCl .

H. JERMAIN CRIGHTON

Studies of iridescent color and the structure producing it. III. The colors of Labrador feldspar. LORD RAYLEIGH. *Proc. Roy. Soc. (London)* 103A, 34-45(1923).—Colors produced by the reflection of a "pointolite" lamp, and by thin plates illuminated by an arrangement similar to that used in the ultramicroscope were studied. The reflected colors were also examd. spectroscopically. The colors seen by reflection arise from 2 distinct origins, (1) a specular reflection from tabular inclusions which show the colors of thin plates, and are often as much as 0.2 mm. in dimensions (these are distributed parallel to one of the cleavages), and (2) a diffuse reflection from a plane about 15° away from the cleavage above mentioned. This is the source of the striking colors which ordinarily excite attention. When the diffuse reflecting plane is examd. microscopically, under conditions which insure that the light only comes from a very thin stratum, it is found that the plane of reflection is discontinuous or patchy. The patches are of irregular outline. The diffuse character of the reflection is accounted for by the small diameter of these reflecting surfaces, regarded as independent optical apertures. Their size (0.005 mm.) accounts approx. for the angular diameter of the diffuse image of a point source seen by reflection, if we regard this as a diffraction disk. This explanation requires that the reflecting patches, though parallel, should not be strictly co-planar, but distributed at random in depth. The color of the reflection is not sharply limited to special regions of the spectrum, and it appears that the color can be explained by the interference of streams of light from the two surfaces of each patch. The patches may be fissures in the material, and there is evidence that their thickness is not absolutely uniform. The brightness of the color is explicable by the large no. of reflecting patches adding their effects, without definite phase relation, such as would give rise to regular interference. There is no reason whatever for supposing that reflection from twin planes has anything to do with the color, though the colored material itself is often stratified in accordance with the twinning. Photomicrographs of the structure, giving rise to the specular and diffuse colored reflections, are reproduced.

L. W. ROGGS

Chemistry—the key to international relations. H. E. HOWE. *Chemistry & Industry* 42, 510-3, 530-4(1923).

E. J. C.

The organization of research. J. C. IRVINE. *Rept. Brit. Assoc. Advancement Sci.* 1922, 25-32(1923).

E. J. C.

Educational and school science. RICHARD GREGORY. *Rept. Brit. Assoc. Advancement Sci.* 1922, 204-18(1923).

E. J. C.

Chemistry at Yale 112 years ago. W. F. HOFFMAN. *Chem. Bull.* (Chicago) 10, 145-6(1923). E. J. C.

Ammoniates as binary systems (FRIEDRICHS) 6. Some factors affecting the accuracy of Saybolt viscosity measurements and their control (KLOPSTEG, STANNARD) 1.

CODD, L. W.: **Nernst's Theoretical Chemistry.** From the standpoint of Avogadro's rule and thermodynamics. Revised in accordance with the eighth-tenth German edition. London: Macmillan & Co., Ltd., 922 pp. 28s. net.

DUSHMAN, S.: **Production and Measurement of High Vacuum.** Schenectady, N. Y.: General Electric Co. 239 pp. \$2.75. Reviewed in *Ind. Eng. Chem.* 15, 761 (1923).

3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

Röntgen interference spectra and crystal structure. H. PRELINGER. *Elektrotechn. Maschinenbau.* 41, 247-8, 268-71(1923).—A short review. C. G. F.

Ionization by collision in helium. J. S. TOWNSEND. *Phil. Mag.* 45, 1071-9 (1923).—There is a discrepancy between the early result of Gill and Pidduck (*C. A.* 6, 2030) that helium is normally ionized between parallel plate electrodes according to the same law as diatomic gases and the modern idea regarding ionization potentials and the results of current detns. in triode systems leading to a step-curve for the voltage-current relation. A more recent repetition by Ayres (*C. A.* 17, 1584) of the work of G. and P. beginning with lower voltages and detg. more points has failed to show a step-curve. In the present paper T. gives a very elegant analysis of his results with Ayres on He, from which he concludes $C + \bar{W} = 14$ v. and $\bar{V} = 16.6$ v. C is the energy necessary to ionize pure He; \bar{W} is av. energy lost in one electronic cycle by non-ionizing collisions and \bar{V} is the mean excess energy possessed by electrons over that necessary to ionize. It is improbable that \bar{W} is negligible compared with C which is probably not less than 12 v. Therefore $C + \bar{V}$ is about 28.6 v. In a small proportion of the collisions between 20 and 25 v. ionization results. There is a considerable difference between these conclusions and those from the triode expts. Instead of 20-25 v. being essential to ionization of He it begins as low as 14 v. The principal difference between the valve and the parallel plate expts. is in the radiation effects. The resonance being less than the ionization potential, resonance collisions will be much more frequent and the resulting total loss of energy $C + \bar{W}$ would be much larger than 14 v. S. C. LIND

Duration of the process of light emission in hydrogen. A. J. DEMPSTER. *Astrophys. J.* 57, 193-208(1923).—Canal rays, when allowed to pass through a small hole in the cathode into a 2nd chamber (at a much lower pressure), are under certain conditions luminous from 1.5 to 4 cm. Under conditions of lower pressure in the discharge tube with higher voltages, a continuous luminous bundle appears, which masks the dying out phenomenon. Both types are shown to be luminous particles being carried into the low-pressure chamber. No rays are present which die out in a time shorter than 10^{-7} sec., while the continuous bundle must have a life longer than 5×10^{-7} sec. A strong elec. field has no effect upon either type. It is proposed that the short-lived particles are neutral H atoms and that the continuous bundle is due to dissociating neutral mols. The classical theory and Bohr's theory are discussed in connection with the above observations, and the observations of the Stark effect in a variable field. D. C. BARDWELL

The capture of electrons by swiftly moving alpha particles. BERGEN DAVIS. *Nature* 111, 706(1923).—Recent expts. by Henderson (*C. A.* 17, 1375) indicate that an α -particle from Ra C takes up one electron when its velocity is reduced to 8.2×10^8 cm. per sec., and a 2nd electron is taken up at $v = 3.1 \times 10^8$ cm./sec. D. calcs. that a free electron can fall (parabolically) into the K ring of a doubly charged He at. when the velocity of the latter is reduced to 6.2×10^8 cm./sec. and a 2nd electron can fall into the K ring at $v = 3.2 \times 10^8$ cm./sec. The agreement is sufficiently close to suggest that this may be the proper explanation of the failure of α -particles to pick up electrons in the first part of their path. D. C. BARDWELL

The relation of actinium to uranium. A. S. RUSSELL. *Nature* 111, 703-4(1923).—R. agrees with Piccard that the parent substance of the Act series is an isotope of U with

at. wt. of 240, but believes that Act has at. wt. of 228 (not 232). The following scheme is presented and reasons are given for its support.

Element.	Period.	At. no.	Radiation	At. wt.
Actino-uranium I	$> 5 \times 10^6$ yrs.	92	α	240
Uranium Y_1	25.5 hours	90	β	236
Uranium Y_2	probably very short	91	β	236
Actino-uranium II	$> 2 \times 10^6$ yrs.	92	α	236
Parent of proto-actinium	> 20 yrs.	90	β	232
Proto-actinium	$< 1.2 \times 10^4$ yrs.	91	α	232
Actinium	20 yrs.	89	β	228
Radio-actinium	19.5 days	90	α	228

The data in this scheme do not contravene the Geiger-Nuttall relation, and there are no exceptions to Fajan's ray rule. They eliminate 2 of the 3 hitherto existing exceptions to Fajan's ray rule. The relations between U Z and U X reported by O. Hahn (C. A. 17, 1919) have been confirmed by W. G. Guy. D. C. BARDWELL

Dispersion of light by an electron gas. LEIGH PAGE. *Astrophys. J.* 57, 238-42 (1923).—An electromagnetic theory of the dispersion of an electron gas is deduced. The phase velocity in such a gas is found to be a function of the wave length slightly greater than the velocity of light in a vacuum. From Shapely's estimate of a difference between the velocities of blue and yellow light not greater than 0.1 m. per sec., an upper limit to the no. of electrons per cc. in interplanetary space is computed to be 3×10^{11} for electrons and 5×10^{14} for protons. The expressions for elec. and magnetic vectors are checked by the laws of conservation of momentum and energy. D. C. BARDWELL

The spectrum of the semicircular helium model. H. O. NEWBOULT. *Phil. Mag.* 45, 1085-7 (1923).—N. uses Langmuir's (C. A. 15, 2381) hypothesis of electrons vibrating in opposite direction about the He nucleus to calc. some of the spectral lines which would result. The lines found are outside the limits of any known spectrum, and N. concludes that the hypothesis is not correct in spite of the fact that it leads to the correct ionization potential of He as shown by Langmuir. S. C. L.

The Stark effect for strong electric fields. H. O. NEWBOULT. *Phil. Mag.* 45, 1080-5 (1923).—A note of correction in mathematical form to the two recent papers on this subject by Mosharrafa (C. A. 16, 2451, 4136). S. C. L.

The distribution of energy in the lines of the Balmer series of hydrogen. R. T. BEATTY. *Phil. Mag.* 45, 1080-1 (1923).—Referring to recent results of Lasareff B. compares them with earlier ones of Jolly (C. A. 8, 615) and of Beatty (C. A. 11, 1593). The wide discrepancies are to be expected from the different conditions of discharge. L. failed to take into account the influence of foreign gases and absorption within the tube. L.'s argument, that the relative energy from each line divided by the corresponding ν 's gives the relative no. of atoms radiating in each node, is unsound on account of neglecting other influences such as collisions, field of force of other atoms, absorption of radiation by other excited atoms, and the back-ground due to the secondary spectrum of H. S. C. L.

Fluorescence and channelled absorption spectra of cesium and other alkali elements. J. C. McLENNAN AND D. S. AINSLIE. *Proc. Roy. Soc. (London)* 103A, 304-14 (1923).—The channelled absorption spectra of Na and K, discovered in 1874, and the fluorescence spectra of these same metals, discovered in 1896, have been studied extensively by R. W. Wood and others. For example it was shown that Na vapor gave several series of absorption bands, one on the red side of the first lines of the principal series (D lines), another in the blue-green part of the spectrum and an additional series in the ultra-violet near the second doublet of the principal series. By stimulating the Na vapor with approx. monochromatic light there resulted an emission of light, the spectrum of which consisted of a number of bright narrow bands of varying intensity, more or less regularly spaced on either side of the mean wave length of the exciting light. Partial results of similar nature have been recorded for K and Rb. These are now repeated for Na, K, and Rb and extended to Cs, which heretofore had not been shown to possess either fluorescence or absorption spectra. The spectra were photographed with a glass-prism const.-deviation spectrograph; panchromatic plates were used for the visible spectrum and plates dyed with dicyanin A for the infra-red. The metals were distd. into evacuated Pyrex bulbs which had the form of oblate spheroids with plane sides, the longer diams. being about 8 cm. These were heated in an elec. oven. To photograph the absorption spectra, light from an elec. arc or a Pointolite lamp was projected through a bulb along its longer axis and focussed on the slit of the spectrograph. The fluorescence spectra were observed through the flat side of the bulb at

right angles to the exciting light. The results are presented in spectral reproductions and tables of wave lengths. For K vapor, in addition to the known banded fluorescence and absorption spectra in the orange-red region, a banded absorption spectrum was found in the infra-red between 8200 and 8625 Å. and another in the region 4150 to 4500 Å. This completes the analogy between K and Na. Only one region of absorption, 6706 to 7100 Å. was found for Rb. A fluorescence spectrum, between 6540 and 7100 Å., which was channelled on the long wave side but continuous on the other, was obtained for Rb. With Cs vapor a channelled absorption spectrum extending between 7560 and 7800 Å., and a fluorescence spectrum consisting of an unresolved band between 7540 and 8000 Å. were obtained. With white-light excitation of these alkali vapors it does not appear that there are any const. wave-length or frequency differences in the band spacing of the fluorescence spectra.

W. F. MEGGERS

The structure of the band spectrum of helium. II. W. E. CURTIS. *Proc. Roy. Soc. (London)* 103A, 315-33(1923).—An account has been given in a previous paper (cf. *C. A.* 16, 2077) of 3 He bands (at 6400, 5730 and 4546 Å.); it is now proposed to deal, in this and a subsequent paper, with the remaining bands constituting the spectrum between 7000 and 3000 Å. In the present paper, seven of the doublet bands previously examd. by Fowler are studied in detail. Three of these belong to the so-called "main" series and are found in the spectrum near 4650, 3680 and 3350 Å. The other four belong to the "second" series and occur near 5130, 4000, 3630 and 3460 Å. Tables of wave lengths and least-squares empirical formulas are given for the constituent P, Q, and R' series of each band. The structure of the bands is, in the main, in agreement with the requirements of the quantum theory, but some important discrepancies are noted and discussed. Values for the moments of inertia of the mols. are derived both by calcn. from the series formulas and by a graphical method. These are of the order of 2.06×10^{-40} for the initial or energized mol. and 1.73×10^{-40} for the final or stable mol. A remarkable feature is the large difference between the stable and energized moments of inertia in comparison with the small variation of the latter among themselves when derived from the different bands. It appears to indicate that the mol. concerned in the production of different sets of bands is practically the same and although the removal of an electron from the innermost to the next orbit considerably modifies the configuration of the mol., subsequent transitions have relatively little effect. Several perturbations, the first examples in this spectrum, are recorded and they may require some modification of the theory of band spectra.

W. F. MEGGERS

Series spectra of the aluminium sub-group. J. A. CARROLL. *Proc. Roy. Soc. (London)* 103A, 334-8(1923).—The arc spectra of the elements of the Al sub-group (Ga, In, and Tl) have been arranged in series consisting of widely spaced doublets, but, in contrast with the series of the alkali metals, the convergence frequency of the principal series is less than that of the subordinate ones. It would thus appear that in the normal state of the atom the valence electron which produces the arc spectrum by its excursions must be in a 1p orbit and not in a 1s orbit, as was supposed always to be the case. The normal state of the atom can be ascertained from absorption expts. In the case of the alkali metals, the absorption spectra of the non-luminous vapors exhibit only principal series lines converging at 1s, which represents the electron orbit in the normal state, and if the normal state be represented by 1p in the Al sub-group, only the lines of the subordinate series should be reversed in the absorption spectra. Previous observations on the absorption of non-luminous Tl vapor were not very conclusive; so that further observations extending over a spectral range from 2500 to 7000 Å. were undertaken. The absorption tube was of Fe, 1 in. in diam. and 16 in. long, closed at the ends with quartz plates and wound with a heating coil. Light from the crater of a C arc was coucd. by a lens and passed through the tube on to the slit of a spectrograph. In this way the lines of the sharp and diffuse series of Tl were obtained as reversals on the continuous background but no trace of absorption lines corresponding to the principal series was detected. Tables of the reversed lines and reproductions of the spectra are presented. The results are in accordance with the latest developments of Bohr's theory which, in the case of Tl, assigns two of the outermost electrons to 6_s orbits and one to a 6_p orbit. It is the electron in the orbit with azimuthal quantum number 2 which gives rise to the arc spectrum and which corresponds to the 1p limit representing the normal state of the atom.

W. F. MEGGERS

Demonstrations in the field of radioactivity (LUDRWIG) 1. The action of light on a photographic film (WOODROW) 5. Use of the oxy-acetylene blowpipe in spectrum analysis (DE GRAMONT) 7.

4—ELECTROCHEMISTRY

COLIN G. FINK

Decreasing the power consumption in electrochemical processes. FERNAND BOITARD. *Industrie chimique* 8, 437-40(1921); 10, 154-7(1923).—Discussion of the principles governing efficiency of electrochem. reactions and of the means of obtaining max. efficiency in com. operations.

Some effects of current in metallurgical operations. B. D. SAKLATWALLA. *Elec. World* 81, 1413-4(1923).—It is suggested that elec. and magnetic effects of the current may aid in the purification of the product, and may provide a means for controlling the crystal growth and structure in the ingot while cooling.

Electric melting of metals. J. BULL. *Norges Geol. Undersøkelse* 104, 28 pp. (1922); (Publication No. 4 of Norwegian Governmental Raw Material Committee).—The cost of elec. melting of brass in the foundry is shown to be cheaper than in coke-fired furnaces (1.1 cents per lb. vs. 1.8 cents), owing to smaller loss of metal (1% vs. 4%), lower labor cost and longer life of furnace linings. Also the product is better and more uniform in quality. The furnace tested was a 200 lb. crucible furnace from the Morgan Crucible Co., London. In this the crucible itself is the heating element, a nonconducting lining preventing short-circuiting of current through the melted metal. The efficiency was 50% and the life of the crucible was 40 to 50 melts when operated on a day shift and 100 melts when operated continuously. The importance of accurate temp. control is emphasized.

Why electric heat treating is economical. E. F. COLLINS. *Elec. World* 81, 1402-5 (1923).—Comparative figures are given to show that with present-day costs of fuel and electricity, the use of elec. heat may be economical in many industrial processes. Various other advantages of elec. heat treating are pointed out.

Artificial production of graphite. E. RISHKEVICH. *Brennstoff-Chem.* 4, 39-43 (1923).—An outline is given of the elec.-furnace process for the production of graphite from anthracite coal and SiO_2 .

Electrolytic production of alkali chlorates at anodes of magnetic iron oxide. G. GRUBE AND F. PFUNDER. *Z. Elektrochem.* 29, 150-63(1923).—Lower yields of chlorate are obtained when neutral solns. of alkali chlorides are electrolyzed with a Fe_3O_4 anode than with a Pt anode, owing to discharge of OH ions. There is a further decrease in efficiency due to catalytic decompn. of HClO at the anode into HCl and O . By acidifying the electrolyte during electrolysis and raising the temp. to 60-70° the yield of chlorate can be increased to 85-90% when a c. d. of 0.015 amp./cm.² is employed. Electrolysis of alk. hypochlorite solns., using a Fe_3O_4 anode, indicates that the mechanism of chlorate formation is the same as with Pt anodes. In cold neutral solns. the principal reaction is $6\text{ClO}^- + 3\text{H}_2\text{O} + 6\oplus = 6\text{H}^+ + 2\text{ClO}_3^- + 4\text{Cl}^- + 3\text{O}$, while in hot acid solns. chlorate is produced chiefly in accordance with the secondary reaction, $2\text{HClO} + \text{NaClO} = \text{NaClO}_3 + 2\text{HCl}$.

The importance of diffusion in organic electrochemistry. R. E. WILSON AND M. A. YOUTZ. *Ind. Eng. Chem.* 15, 603-6(1923).—Expts. on the chlorination of FeCl_3 solns. of varying concn. indicate that the rate of diffusion of the reacting compds. to the electrode is likely to be the limiting factor in detg. the rate of reaction at an electrode, particularly with org. compds. The results are explained quant. by known diffusion laws. With certain approx. assumptions, the thickness of the effective layer through which diffusion must take place is shown to be approx. 0.5 mm. in quiet solns. This may be reduced to 0.2 its value or less by sufficient stirring. Several expedients are suggested by which the difficulties due to slow rates of diffusion can be overcome in org. electrochemistry.

Regeneration of carbon-manganese dioxide electrodes. (LeClanché cell.) R. NOWOTNY. *Elek. Maschinenbau* 39, 349-54(1921); *Science Abstracts* 24B, 571-2.—N., with J. Steigel and A. Wrba, short-circuits new and old cells, or their bags, through 20 ohms for up to 40 days, detg. the p. d. at the terminals at intervals. According to R. Lohnstein (1913) the electrodes are kept for a day or two in H_2SO_4 of 10 or 20%; the p. d. is to rise. Treating cells in this way N. found that the p. d. did rise to 2.09 v., because, he suggests, the cell is really a Zn-C couple in H_2SO_4 after that treatment; in his tests, however, the cells became exhausted in 7 days. In the similar process of R. Gollmer (*Telef. Fernspr. Techn.* 6, 118(1917)) the bags are first washed in water for 2 days, then kept in H_2SO_4 of 10%, and washed and dried for weeks. In his case again the exhaustion was rather rapid, and in neither case was there any evidence of a re-oxidation of any Mn oxide to dioxide. Fairly satisfactory results are, however, said to

be obtained with these processes in practice. According to another German war process the depolarizers are cleaned, washed with water, and boiled in NH_4Cl ; the mass is then ground fine, and the electrode is built up again. N. found the process very satisfactory for wet and dry cells. But the process practically involves building up new cells out of old materials, and he obtained equally good results when he merely boiled the cleaned bags twice for 2 hrs. in NH_4Cl of 10%, or for a shorter period in stronger soln. The essence of the process lies therefore in the clearing of the pores clogged by salts and impurities; the double Zn-NH_4 chloride forming in the cell is insol. in the cold NH_4Cl of the cell, but sol. in hot soln. A treatment of exhausted depolarizers with H_2SO_4 was unsatisfactory. In none of these cases is there any noteworthy regeneration of the MnO_2 , the reduced depolarizer. This can be attained by the processes of Olivier and of Friedrich, who electrolyze in NH_4Cl of 6% or more by currents of 0.2 amp. (Olivier, *Telegr.-Fernspr. Techn.* 6, 97-9(1917)). N. tried electrolysis of exhausted bags in H_2SO_4 ; the ratio $\text{MnO}_2 : \text{Mn}_2\text{O}_3$ decidedly increased, but the bags failed soon afterwards. He therefore considers that even in the electrolytic processes the success is largely due to the solvent action of the hot NH_4Cl , as Olivier himself admitted.

H. G.
United States Government specifications for dry cells. ANON. Bur. of Standards, Circ. No. 139, 9 pp.(1923).

E. J. C.
A very high intensity arc discharge (suitable also for nitrogen fixation). H. GERDIEN AND A. LOYZ. *Wiss. Veröffentl. Siemens-Konzern* 2, 489-96(1922).—The positive column of an arc discharge is constricted by means of an orifice, 5 mm. in diam., in a water-cooled metal diaphragm, so that the c. d. in the constriction exceeds 100 amps. per sq. mm. The emitted light shows the H series lines much broadened and in part reversed. The intrinsic brilliancy in parts is from 20 to 50 times that of the positive crater of the C arc. The intrinsic brilliancy of the continuous emission is from 2 to 5 times as great as that of the positive C. Lines characteristic of Zn, Pb, Cd, Cu, Na, K and C with an intrinsic brilliancy exceeding that of the H lines are obtained by introducing the appropriate wire or rod of compressed powder into the discharge. In consequence of the high-temp. gradient in the diaphragm, reactions such as the oxidation of N readily occur. The voltage drop in the diaphragm is about 40 v. per cm.

J. S. C. I.
Applying the results of high-voltage research to practice. F. W. PEEK, JR. *Gen. Elec. Rev.* 26, 407(1923).—1,500,000 volt, single-phase circuits are available for testing porcelain high tension insulators, corona losses, etc. Also available are: 1,000,000 volts, 3-phase (root mean square) at com. frequencies; damped and undamped high frequency oscillation, etc.

C. G. F.
The large capacity mercury arc rectifier. A. ODERMATT. *Elektrotechn. Maschinenbau* 41, 137-45(1923); 21 illus.—This steel tube Hg arc rectifier is a development of the old glass tube Hg arc rectifier. Owing largely to improved gaskets (composed of asbestos-rubber-Hg) the steel tubes can be exhausted down to 0.0001 mm. Hg. Among the principal advantages of the new rectifier are: high efficiency with variable load; low maintenance costs; unaffected by surges or short circuits; noiseless operation.

C. G. F.
Water-cooled resistors. H. F. WILSON. *Gen. Elec. Rev.* 26, 258-62(1923).—The resistors described have a capacity of from 10,000 to 20,000 amp. and 0.0015 to 0.013 ohms.

C. G. F.
Newer aspects of ionization problems (TAYLOR) 2.

COOPER, W. R.: *Electro-Chemistry Related to Engineering*. Edited by B. Blount and W. H. Woodcock. London: Constable and Co. Ltd.

Primary galvanic batteries. E. W. JUNGNER. Can. 231,483, May 29, 1923. A primary battery has a porous C electrode impregnated to prevent the electrolyte from entering the pores of the electrode.

Separators for storage batteries. E. ANDERSON. U. S. 1,458,377, June 12. Separators are formed of granulated Al_2O_3 or other granulated refractory material and a vitrified bonding material.

Dry electric battery. L. LEVAILLANT. U. S. 1,458,307, June 12. A hard C shell contains within its hollow portion a soft active "C Mn" mixt. over which a Zn plate is fitted. A porous diaphragm is placed between the electrodes with an electrolyte between the diaphragm and the Zn plate. The latter is formed with a neck through which electrolyte can be introduced after the electrodes have been assembled and connected.

Battery plates. W. ROBERTS. Can. 232,041, June 19, 1923.

Battery or accumulator. A. POUCHAIN. Can. 232,038, June 19, 1923. Each plate forming an electrode has a conductor wound around it and engaging its lower edge, the conductor being incapable of attack by the electrolyte and carrying means for connecting with the external circuit.

Electric accumulators. A. POUCHAIN. Can. 232,037, June 19, 1923. An electrolyte for storage batteries contains ZnSO_4 , $\text{Al}_2(\text{SO}_4)_3$, an alk. sulfate, HgSO_4 and a polyvalent alc. of the aliphatic series.

Foraminous electrode structures. WM. G. ALLAN. Can. 232,154, June 19, 1923. An electrode for electrolytic purposes is made of superposed plies of wire cloth.

Electrolytic apparatus. WM. G. ALLAN. Can. 232,153, June 19, 1923.

Electrolytic apparatus. WM. G. ALLAN. Can. 231,945, June 12, 1923.

Electrolytic apparatus. JAMES N. SMITH. Can. 231,141, May 15, 1923.

Lining electric induction furnaces. J. FUNCK. Can. 231,941, June 12, 1923. The lining material is placed around a templet in the furnace hearth and the templet is used for heating and consolidating the material to form the lining *in situ*. The templet may then be fused to form the first charge for the furnace.

Oxidation of nitrogen in electric furnaces. O. JENSEN. Can. 231,671, June 5, 1923. In the production of N products by the circulation of gases through an elec. furnace the gases from the absorption tower are brought into direct contact with a cooling liquid and then heated to such a temp. that no condensation will take place in the pipes or machinery.

Extracting copper from sulfide ores. KRISTIANSDALS NICKELRAFFINERINGSVERK. Norw. 35,673, Sept. 11, 1922. The ore is roasted, leached and then the liquor is electrolyzed to ppt. Cu. Before the 2nd roasting certain salts are added to the ore to facilitate the roasting and leaching. The procedure is conducted in such a way that the Fe content of the electrolyte is kept low to avoid the use of diaphragms.

5—PHOTOGRAPHY

C. E. K. MEES

The theory of photography. W. D. BANCROFT. *Trans. Faraday Soc.* (advance proof) 1923.—A review and criticism of recent research. Some of the difficulties in accounting for plate-sensitiveness are avoided by assuming that the AgBr grain is a complex of AgBr, gelatin, and H_2O , and that the ripening consists in an unsp. change in the relative proportions of these three constituents. The relation of the observations and conclusions of Svedberg, Silberstein, Clark, Slade and Higson, and Sheppard and Trivelli on the sensitiveness of the AgBr grain are discussed in reference to Clark's observation that Na arsenite soln. affects AgBr similarly to light. A latent image consisting of Ag absorbed by AgBr most satisfactorily accounts for the observed phenomena, especially those of solarization. It appears that the complete properties of developers seem to be explained by assuming that there is a selective absorption of the developer and thus different concns. at the surfaces of the AgBr grain. The possibility of an absorption theory is fully discussed in relation to the views of Sheppard.

C. E. K. MEES

Some future problems in photography. I. PLOTNIKOV. *Trans. Faraday Soc.* (advance proof) 1923.—The most promising line of investigation on the photochemistry of the photographic plates is that of the pure solns. of Ag salts; the blackening of a plate is only a summation of a host of indefinable, and other accidental, factors. For a definite scale for the photographic plate, an international "Normal plate" is proposed, produced according to a standard formula with characteristics rendering it ideal for use in scientific research and a standard for the comparison of commercial varieties. A color process should be developed, based on the principle of the bleaching of colors. C. E. K. MEES

The theory of photographic dye mordanting. E. R. BULLOCK. *Trans. Faraday Soc.* (advance proof) 1923.—While dye mordanting applied to photography has not been found to conform closely to any simple theory, yet when the disturbing effect of gelatin is sufficiently reduced the results of expt. agree very fairly with the principle of the mutual pptn. of oppositely charged colloids. It is found that any image of a pronounced negative character is a mordant for basic dyes, and *vice versa*; e. g., the decompn. of methyl violet on a AgI image as an instance of the firing of a basic dye and conversely the retention of acid dyes by gelatin contg. $\text{Al}(\text{OH})_3$. The influence of the gelatin may be so great as to reverse this tendency, but the effect may be minimized in practice.

Mordanting power increases with the dispersity of the mordant within wide limits.

C. E. K. MEES

Notes on the photographic chemistry of gelatin. S. E. SHEPPARD, F. A. ELLIOTT, S. S. SWERT. *Trans. Faraday Soc.* (advance proof) 1923.—The influence of gelatin on sensitivity is affected more by incidental factors than by the physical chemistry of gelatin. Gelatins having the same viscosity, physical properties, and proportion of hydrolyzates, will give the same emulsion structure, *i. e.*, as regards the dispersion of AgBr grains, assuming comparable emulsion formulas and procedure. The influence of gelatin on the emulsion after exposure depends chiefly on the physical chemistry of the hydrogel. Gelatin sheets on semi-rigid supports contract laterally to different extents, depending upon the origin of the gelatin; this and certain effects of swelling and expansion favor some form of fibrillar theory of inner structure.

C. E. K. MEES

The physical chemistry of the vehicle and the emulsion. T. S. PRICE. *Trans. Faraday Soc.* (advance proof) 1923.—The first section of the paper discusses the properties of gelatin which make it particularly suitable as an emulsion medium. Gelatin sols change to a stiff gel simply by the lowering of temp. Also, modification of the physical properties is produced by the presence of extraneous substances. The swelling of gelatin in H_2O is an item in the manipulation of photographic materials. The chief influence of gelatin on the emulsion is the protective action on Ag colloids and the principal observations are discussed. Similarly, the reason for the sensitizing action of gelatin is attributed to the presence or absence of traces of sp. impurities rather than to the gelatin itself.

C. E. K. MEES

The sensitivity of a silver bromide emulsion. W. CLARK. *Trans. Faraday Soc.* (advance proof) 1923.—In connection with the expts. recently made, proving that the sensitivity of a fast AgBr plate is due primarily to the presence of some other material the removal of which reduces the speed to a certain low minimum, it is shown that the substance constituting the latent image is much more readily attacked by CrO_3 than the sensitivity-giving material itself. Expts. have also proved that the cause of reduction in speed produced by CrO_3 treatment is not a mere adsorption of the desensitizer on the surface of the halide. The fact that the effect is to increase the gamma of a plate is in accordance with the supposition that the action involved is the removal of the sensitive centers present in the grains, and further work designed to test this point is in progress.

C. E. K. MEES

The solubility of silver bromide in ammonium bromide and gelatin. C. WINTHER. *Trans. Faraday Soc.* (advance proof) 1923.—The solns. used corresponded as closely as possible with those employed in emulsion making. If the NH_4I and NH_4Cl added in one series of tests were reckoned as bromides, the soly. product of the Ag and Br ions obtained throughout the series showed a fairly close agreement. It is concluded that the soly. of AgBr in H_2O is not altered by the addition of gelatin, erythrosin and small amts. of NH_4I or NH_4Cl and that, by the addition of bromide, the soly. is decreased in accordance with the law of mass action.

C. E. K. MEES

Most important adsorption reactions in the photographic film. LÜPPO-CRAMER. *Trans. Faraday Soc.* (advance proof) 1923.—Of the adsorption phenomena of Ag halides only those of optical sensitizing and desensitizing are considered. AgI remains curiously indifferent to the action of sensitizing dyes, despite its notable power of adsorbing dyes; this is attributed less to its chem. nature than to the less compact texture of the crystals. Grain size is of great importance in sensitizing, since with increasing size of grain the sp. area of surface capable of being dyed decreases, and while many optically sensitizing dyes act also as chemical sensitizers (*i. e.*, by increasing the total sensitivity toward white light) this is believed to occur only in the case of very fine grains. The black Ag of the photographic image also shows a strong adsorptive power, notably toward thiosulfate and Ag_2S . Its combination with thiosulfate is considered to explain the peculiar reducing action of persulfate on the grounds of the greater adsorption of thiosulfate on the more finely divided grains in the less exposed parts of the negative.

C. E. K. MEES

The action of light on a photographic film. J. W. WOODROW. *Phys. Rev.* 19, 259–60 (1922).—When plane polarized light produces photoelec. emission more electrons are liberated when the elec. vibration is normal to the surface than when it is parallel to it. A grating was photographed by polarized light and the lines parallel to the electric vector were found to be the sharper in the developed image. No difference in the appearance of the lines could be detected visually. The result is regarded as support for a photoelectric explanation of the photographic action of light.

C. E. K. MEES

Plate sensitometry. O. BLOCH. *Trans. Faraday Soc.* (advance proof) 1923.—The complexity of any system of rating plates for speed is shown by a plate with an unusually

long inflection period yielding an H. and D. number of about 90 if this figure is derived from the straight line part of the curve. In practice such a portrait plate is used chiefly in the inflection part of the curve and has a real working speed of about 350 H. and D. The paper describes a method of measuring fog, taking into account its variation with the degree of exposure. For detg. the gamma line of an emulsion a number of exposures are made in the straight-line part of the curve; development is done under conditions which obviate invasion of the developer at the edges of the plate strip; and fog values are deducted from the measured densities. In making curves showing the behavior of a plate in under-exposure, a very feeble light source is used so as to allow for fairly long exposures accurately timed. The "Schwellenwert" of the plate can be obtained from the measurements. While recording improvements in plate sensitometry, the author repeats his conclusion from examination of methods reviewed in 1917, namely, that from the point of view of the user the present systems of measuring and expressing plate speed are still unsatisfactory.

C. E. K. MEES

Nucleus isolation and desensitization. LÜPPO-CRAMER. *Trans. Faraday Soc.* (advance proof) 1923.—L.-C. records new observations which have caused him to abandon the evidence on which was based his oxidation theory of desensitizing dyes. Since many typical sensitizers and developing agents reduce the latent image photographically in the presence of bromide, it is suggested that the bromide is the real oxidizing agent, the dyes and developers only facilitating the action. While the oxidation theory is left without exptl. support, the feeble oxidizing power of the desensitizers may be considered to offer a plausible explanation of their desensitizing action in the absence of any appreciable photographic reduction of the latent image.

C. E. K. M.

Exposure theories. S. R. SHEPPARD, A. P. H. TRIVELLI AND E. P. WIGHTMAN. *Trans. Faraday Soc.* (advance proof) 1923.—The development of the theory of exposure is traced from the ideas of Hurter and Driffield to the newer theories recognizing the disperse nature of the emulsion and the widely differing character of the grains. With normal developers and exposures, grains which have started to develop become entirely reduced, regardless of exposure, and a grain is either wholly developable or not at all. Hence, not the ultimate size of the developed grains, but the number only, is affected by exposure except in the over-exposure region. Confirmatory evidence is given of the suggestion that, provided sufficient exposure be given, there is no "critical" wave length at which the power of affecting photographic emulsions ceases. As the result of expts. in chromic acid desensitizing it is concluded that the nuclei in the grains are pre-existent before exposure, and the greater resistivity of the larger grains to desensitizing agents is suggested as connected with the fact that the nucleus area increases with grain size.

C. E. K. MEES

The mechanism of latent-image formation. F. C. TOY. *Trans. Faraday Soc.* (advance proof) 1923.—The fact that the single Ag halide crystal is the fundamental unit upon which any theory must rest promises great advance in the theory of the latent image as does the discovery by Svedberg of the development centers in the grains of an emulsion, for the origin of which 3 theories have been advanced. The first, ascribing their formation to the action of discrete quanta of light during exposure, has been discussed elsewhere (*C. A.* 16, 3441). The second supposes the centers, pre-existent before exposure, to be changed by general light action so as to act as reduction centers, and it is shown that certain of the premises advanced are disproved by the topographical arrangement of the center. The third theory assumes heterogeneous radiation incident on grains containing specially light-sensitive points; it is concluded that this theory is untenable while the "light dart" idea is maintained since all the evidence is fundamentally opposed to the idea of discrete transmission of quanta. Hence, the only theory not dismissed is the second, and the recent work of Clark has shown the extreme light-sensitiveness of the silver halide of an emulsion to arise from the presence of minute traces of some other substance.

C. E. K. MEES

The resistivity of various materials towards photographic solutions. J. I. CRABTREE AND G. E. MATTHEWS. *Ind. Eng. Chem.* 15, 666-71(1923).—Of the metals and alloys, Pb, Ni, Niaco, and Monel are the most resistive to photographic solns. But these are only suitable for developing and washing app. Toning baths attack all metals. With fixing baths a protective layer of Ag is placed on the metal tending to retard corrosion. Monel is quite satisfactory for clips, hangers, and small tanks not permanently in contact with the solns. Salts of Cu or stannous Sn cause bad developer fog; Cu or Sn or alloys contg. these metals should not be used in contact with developers. Metallic contact of two different metals or alloys causes electrolysis, which hastens the rate of corrosion. Pb-lined tanks are satisfactory for developers and fixing baths if the joints are Pb-burned. Pb piping is suitable if the joints are wiped. Of the non-metallic

materials, glass, enameled steel, well glazed earthenware, hard rubber and wood resist all photographic solutions. Porous earthenware, rubber compn., and impregnated products disintegrate as a result of crystn. of hypo or other salts in the pores of the material. Small dishes should be made of glass, enameled steel or hard rubber. Deep tanks for motion picture work may be of wood (cypress), Pb-lined wood, Alberene stone or slate, well glazed stoneware, or portland cement. Piping should be of Pb, hard rubber, or glass. Also in *Brit. J. Phot.* 70, 366-8(1923).

C. E. K. MEES

The chemistry of the red toning of sulfide-toned prints. A. AND L. LUMIÈRE AND A. SEYEWETZ. *Trans. Faraday Soc.* (advance proof) 1923.—Sulfide-toned images change to a reddish color when treated with AuCl_3 soln. contg. org. S compds. such as $(\text{NH}_2)_2\text{CS}$. This toning is a specific reaction of AgS , which absorbs Au to about 133% of the wt. of the Ag and also an amt. of S somewhat greater than that required for the formation of gold sulfide. The toned image thus appears to consist of a double sulfide of Ag and Au.

C. E. K. MEES

Preservation of diaminophenol and genol developer. NAMIAS. *Sciences, technique et ind. phot.* Feb. 1923; *Industrie chimique* 10, 218-9(1923).—N. has previously proved that genol (methyl-*p*-aminophenol) stabilizes diaminophenol developers against spontaneous oxidation. He recommends it for the development of papers as it gives fine black tones and very pure whites. Oxidation can be retarded by addn. of H_3BO_3 , which does not restrain development like NaHSO_3 . H_3BO_3 also increases the susceptibility of the developer to the action of sol. bromides. The following formula is recommended: H_2O 1000 cc., genol 1.5 g., crystd. NaHSO_3 60 g., diaminophenol 6 g., H_3BO_3 20 g., KBr 3 g.

Tinting and mordanting of cinematographic films. *Sciences, technique et ind. phot.*, Jan., Feb., March 1923; *Industrie chimique* 10, 218(1923).—Tinting is done exclusively with acid dyes which must possess the following characteristics: have no action on gelatin, be fast to washing, to the acidity of the bath, and to heat. The films can be mordanted with metallic salts, which are practical but few in number. Numerous formulas are given.

A. PAPINEAU-COUTURE

SEYEWETZ, A. *Le négatif en photographie*. 2nd ed. Paris: G. Doin. 320 pp. Fr. 14. Reviewed in *Chimie et industrie* 9, 847(1923).

6—INORGANIC CHEMISTRY

H. I. SCHLESINGER

The constitution of aqueous chromic acid solutions. FRIEDRICH AUERBACH. *Z. anorg. allgem. Chem.* 126, 54(1923).—N. R. Dahr (*C. A.* 16, 3274) assumes the existence of the simple acid H_2CrO_4 in aq. solns. of chromic acid of which the first dissociation const. is very great, the second extremely small. This is not new; it is indicated in Abegg-Auerbach's Handbook of Inorganic Chemistry.

L. T. FAIRHALL

Mercuric chloride double salts of platinous ammine bases. D. STRÖMHOLM. *Z. anorg. allgem. Chem.* 126, 129-40(1923).—The prepn. and properties of 27 compds. of the type $\text{RCl}(\text{HgCl}_2)_2$ are described. The compds. isolated were $(\text{NH}_3)_2\text{PtCl}_2\text{HgCl}_2$, $(\text{MeNH}_2)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $(\text{EtNH}_2)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $(\text{PrNH}_2)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $(\text{BuNH}_2)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $(\text{C}_2\text{H}_5\text{N}_2\text{H}_4)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $(\text{C}_4\text{H}_9\text{N})_2\text{PtCl}_2(\text{HgCl}_2)_2$, $\text{cis}-(\text{NH}_3)_2(\text{MeNH}_2)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $\text{trans}-(\text{NH}_3)_2(\text{MeNH}_2)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $\text{cis}-(\text{NH}_3)_2(\text{EtNH}_2)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $\text{trans}-(\text{NH}_3)_2(\text{EtNH}_2)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $\text{cis}-(\text{NH}_3)_2(\text{PrNH}_2)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $\text{trans}-(\text{NH}_3)_2(\text{PrNH}_2)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $\text{cis}-(\text{NH}_3)_2(\text{BuNH}_2)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $\text{trans}-(\text{NH}_3)_2(\text{BuNH}_2)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $\text{cis}-(\text{NH}_3)_2(\text{C}_2\text{H}_5\text{N}_2\text{H}_4)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $\text{trans}-(\text{NH}_3)_2(\text{C}_2\text{H}_5\text{N}_2\text{H}_4)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $\text{cis}-(\text{MeNH}_2)_2(\text{EtNH}_2)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $\text{trans}-(\text{MeNH}_2)_2(\text{EtNH}_2)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $\text{cis}-(\text{MeNH}_2)_2(\text{PrNH}_2)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $\text{trans}-(\text{MeNH}_2)_2(\text{PrNH}_2)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $\text{cis}-(\text{MeNH}_2)_2(\text{BuNH}_2)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $\text{trans}-(\text{MeNH}_2)_2(\text{BuNH}_2)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $\text{cis}-(\text{EtNH}_2)_2(\text{PrNH}_2)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $\text{trans}-(\text{EtNH}_2)_2(\text{PrNH}_2)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $\text{cis}-(\text{EtNH}_2)_2(\text{BuNH}_2)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $\text{trans}-(\text{EtNH}_2)_2(\text{BuNH}_2)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $\text{cis}-(\text{PrNH}_2)_2(\text{BuNH}_2)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $\text{trans}-(\text{PrNH}_2)_2(\text{BuNH}_2)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $\text{cis}-(\text{BuNH}_2)_2(\text{C}_2\text{H}_5\text{N}_2\text{H}_4)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $\text{trans}-(\text{BuNH}_2)_2(\text{C}_2\text{H}_5\text{N}_2\text{H}_4)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $(\text{EtNH}_2)_2(\text{C}_2\text{H}_5\text{N}_2\text{H}_4)_2\text{PtCl}_2(\text{HgCl}_2)_2$, $(\text{iso-BuNH}_2)_2(\text{C}_2\text{H}_5\text{N}_2\text{H}_4)_2\text{PtCl}_2(\text{HgCl}_2)_2$. The double salts were prepd. by the addition of the platinum ammine soln. to HgCl_2 soln. nearly satd. at room temp. In general the double compd. sep'd. from the cold soln. Compds. of the type $\text{R}'\text{Cl}(\text{HgCl}_2)_2$ always appear as grains with octahedral surfaces. A similar appearance was noted with the highest compds. of Ca and a few of the platinous ammine bases, such as the $(\text{EtNH}_2)_4$ compd. The platinous ammine compds. often appear as thin plates. A few of the compds. (as $(\text{C}_2\text{H}_5\text{N}_2\text{H}_4)(\text{MeNH}_2)_2$ and $(\text{C}_2\text{H}_5\text{N}_2\text{H}_4)(\text{EtNH}_2)_2$) could assume two forms either as rather large prisms or as grains with octa-

hedral surfaces. Certain compds. of the type $R''Cl_2(HgCl_2)_6$ exist as *cis*- and *trans*-isomers.

L. T. FAIRHALL

The hydrates of molybdenum trioxide. GUSTAV F. HÜTTIG AND BRUNO KÜRRE. *Z. anorg. allgem. Chem.* 126, 167-75(1923); cf. *C. A.* 16, 3280.—The raw material used was the lemon-yellow ppt. which seps. from a HNO_3 soln. of $(NH_4)_2MoO_4$ on standing. The compn. of this was detd. by heating to 460° *in vacuo* to be $MoO_3 \cdot 2H_2O$. Pressure measurements at various temps. indicated the existence successively of the dihydrate and monohydrate. This accords with previous investigations of the authors on the solid hydrates of U, W and chromic oxides. The heats of formation of the various hydrates from the oxides and water were calcd. to be $UO_3 \cdot 1/2 H_2O$ (13,290 cal.), $UO_3 \cdot H_2O$ (23,400 cal.), $UO_3 \cdot 1 1/2 H_2O$ (31,740 cal.), $UO_3 \cdot 2H_2O$ (39,240 cal.), $WO_3 \cdot H_2O$ (20,950 cal.), $MoO_3 \cdot H_2O$ (18,760 cal.), $MoO_3 \cdot 2H_2O$ (33,460 cal.).

L. T. FAIRHALL

Ammoniated silicic acid salts. ROBERT SCHWARZ AND G. A. MATHIS. *Z. anorg. allgem. Chem.* 126, 55-84(1923).—Ammine salts of silicic acid have been unknown heretofore. S. and M. have prepd. a number of these from the metasilicates of bivalent metals and Ag silicate. The metasilicates were pptd. from aq. salt solns. by the addition of Na_2SiO_3 . The silicates thus prepd. always contained water of hydration, the existence of which is necessary for the success of the addition of NH_3 . The following compds. were prepd.: $CuSiO_3 \cdot 2H_2O \cdot NH_3$, $CuSiO_3 \cdot H_2O \cdot NH_3$, $CuSiO_3 \cdot 2H_2O \cdot 2NH_3$ (-16°), $Ag_2SiO_3 \cdot 2H_2O \cdot 2NH_3$, $ZnSiO_3 \cdot H_2O \cdot NH_3$, $PbSiO_3 \cdot H_2O \cdot 1/2 NH_3$, $NiSiO_3 \cdot H_2O \cdot NH_3$, $CoSiO_3 \cdot H_2O \cdot NH_3$. The NH_3 addition is thus confined to 1 or 2 mols. It is noteworthy that Co and Ni, which easily form higher amines, are limited as silicates to the formation of monoamines. Except in the case of Cu, which forms a diamine at -16° , cooling does not result in the formation of higher amines. Also no higher amines are formed by the action of liquid NH_3 at -79° upon the various silicates. NH_3 is without action upon water-free silicates. Thus, NH_3 cannot be substituted for the water of hydration and only the hydrates form addition products.

L. T. FAIRHALL

Ammoniates as binary systems. II. Hydrazine-ammonia. III. Water-ammonia. FRITZ FRIEDRICH. *Z. anorg. allgem. Chem.* 127, 221-7, 228(1923); cf. *C. A.* 15, 2230. II.—The *p*, *t*, *c* diagram of the system $N_2H_4 + NH_3$ was detd. up to the crit. curve. Pure N_2H_4 forms no compd. or mixed crystals with NH_3 . However, traces of H_2O in the system seem to favor the formation of mixed crystals. The *m. p.* of pure N_2H_4 detd. dilatometrically, is $+1.8^\circ$. III.—Preliminary expts. do not confirm the formation of the compds. $H_2O \cdot NH_3$ and $H_2O \cdot 2NH_3$, which were observed by Rupert (*C. A.* 3, 2418; 4, 1952). They indicate, rather, at these concns., a probably continuous series of mixed crystals.

R. H. LOMBARD

Compounds of trivalent chromium and bivalent copper with pyrocatechol. R. WEINLAND AND EDMUND WALTER. *Z. anorg. allgem. Chem.* 126, 141-66(1923).—If NH_4OH in excess is added to a soln. of pyrocatechol and green hexahydrate of $CrCl_3$, a salt is formed having the compn. $[Cr(OC_6H_4O)_2]NH_4 + H_2O$. The NH_4 may be replaced by the various alkali and alk. earth metals. The alkali and guanidine derivs. are easily sol. in H_2O , giving a deep green soln., while the Ba NH_4 salt is difficultly sol., as are most of the other derivs. On diln. with H_2O the green aq. soln. becomes red because of the formation (in the case of the K salt) of a new

anion, $K \left[\begin{array}{c} H_2O \\ \diagdown \\ Cr \begin{array}{c} \diagup OC_6H_4O \\ \diagdown O \\ \diagup OC_6H_4O \end{array} \\ \diagup H_2O \end{array} \right]$. This reaction is reversible. Cupric salts similarly

form salts of the type $[Cu(OC_6H_4O)_2](NH_4)_2$, in which the NH_4 group may be replaced by other metals. The constitution of the chromium salt is most likely

$\left[Cr \left(\begin{array}{c} \diagup O \\ \diagdown O \end{array} C_6H_4 \right)_2 \right] M_3^I$; that of the copper compd. $\left[Cu \left(\begin{array}{c} \diagup O \\ \diagdown O \end{array} C_6H_4 \right)_2 \right] M_2^I$. The

prepn. and properties of a large number of alkali and alk. earth metal, pyridine and guanidine salts of pyrocatechol-chromium and copper derivs. are described. L. T. F.

The colors of inorganic compounds (BILTZ) 2.

7—ANALYTICAL CHEMISTRY

WILLIAM T. HALL

Analytical precipitations at extreme dilutions. I. Barium sulfate. F. L. HAHN AND R. ORTO. *Z. anorg. allgem. Chem.* 126, 257-68(1923).—Diln. favors the formation

of pure ppts. If 10 cc. of N HCl , in a 300-cc. beaker, is heated to boiling and slow streams of $0.025 N$ $BaCl_2$ and K_2SO_4 are simultaneously run into the boiling acid, with about 10% more Ba added than SO_4 , the effect approximates that produced in a dil. soln. although the total vol. is kept low. The ppt. of $BaSO_4$ is coarser-grained and purer than when a fairly dil. soln. of K_2SO_4 is treated with dil. $BaCl_2$ added all at one time. Moreover, it makes little difference whether the soln. is filtered promptly or after standing for some time. The presence of considerable Ca in the soln. of SO_4 tends to prevent the complete pptn. of $BaSO_4$ just as too much HCl does. Fe , Al or even Cr does no harm if the soln. is kept slightly alk. until all of the SO_4 is pptd. This is accomplished by having the $BaCl_2$ soln. slightly ammoniacal. The presence of alkali nitrate does no harm in this method. In the detn. of S in org. compds. by the Carius method it is best to have the $BaCl_2$ in the sealed tube. The theory is proposed that most of the so-called errors of adsorption or occlusion are due to chemical rather than to purely physical forces and to prevent them it is only necessary to have nearly complete ionization when the ppt. is formed and this is the case when a drop of SO_4 soln. is distributed over a relatively much larger vol. and comes in contact with a drop of Ba soln. similarly distributed.

The determination of trithionates in the presence of tetrathionates. E. H. RIESSENFELD, E. JOSEPHY and E. GRÜNTAL. *Z. anorg. allgem. Chem.* 126, 281-4 (1923).—Riesensfeld and Feld (C. A. 16, 1714) proposed a method based upon the formation of CuS from the trithionate by treatment with $CuSO_4$ soln. for 30 min. at the b. p. Kurtenacker and Fritsch (C. A. 16, 2821) found, however, that tetrathionate was decomposed also to some extent. A further study of the reaction shows that correct results can be obtained if the $CuSO_4$ soln. is allowed to act upon the soln. of trithionate and tetrathionate for 1 day at 70° . Under these conditions all of the trithionate is decomposed according to the equation: $S_4O_6^{--} + Cu^{++} + 2H_2O \longrightarrow CuS + 2SO_4^{--} + 4H^+$ and none of the tetrathionate reacts.

The titration of hypochlorous acid. A. SCHLEICHER. *Z. anal. Chem.* 62, 329-35 (1923).—Clarens (C. A. 8, 3279) has claimed that ClO_2 vapors are formed in the titration of $NaClO$ or bleaching powder solns. with As_2O_3 . Expts. with the ordinary titration with iodo-starch paper as indicator have failed to confirm the assertion of C. and the addn. of KBr as indicator, as was recommended by C., was found unsatisfactory. Mech. stirring was found better than hand stirring. Good agreement was obtained by electrometric titration against a buffer soln. Further studies are being conducted.

The determination of solids (or moisture) by means of a gauze dish. A. SEIDENBERG. *Ind. Eng. Chem.* 15, 737-41 (1923).—A dish made from 20 sq. cm. of fine mesh Pt gauze corrugated into about 32 lateral edges and thus compressed into an area of 8.5×5.5 cm. will hold by capillarity about 5 cc. of liquid dropped into it from a slight height. Evapn. in such a dish takes place from both surfaces and excellent results are obtained in the detn. of total solids in sugar solns. or in the detn. of moisture. A series of expts. with evapn. at different temps. indicate that the results obtained with the gauze dish are more satisfactory than when pumice or other finely divided material is used as distributing medium.

The use of the oxy-acetylene blowpipe in spectrum analysis. Applications to mineralogy. A. DE GRAMONT. *Compt. rend.* 176, 1104-9 (1923).—The ease with which many of the metals (the alkalis, the alk. earths, Cu , Ag , Ga , In , Tl , Cr , Mn , Fe , Co , Ni , Sn , Pb , Bi) fuse in the oxy-acetylene flame recommends its use as a luminous source in spectroscopic analysis. For most of the elements the *raies ultimes* will appear in flame spectra; and since the no. of lines observed in the flame are less than in the arc or spark, its use as a source is preferable to either the arc or spark in the analysis of minerals. The method has been applied to various minerals found in Madagascar, results for some of which are given.

Estimation of magnesium in sea water by the use of a single drop of the water. G. DENIGES. *Compt. rend.* 175, 1206-8 (1923).—A series of standards is prepd. by adding 0-14 drops of $0.0005 M$ $MgSO_4$ soln. to 15 different tubes. Each of these is diluted to 5 cc., treated with 1 drop of 3% $NaCl$ soln., 0.5 cc. of 10% KI soln. and 2 drops of freshly prepd. $NaBrO$ soln. The color obtained with the sea water similarly diluted and treated with KI and $NaBrO$ is matched with these standards to det. Mg .

Micro-determination of copper in waste chips, scrap and copper alloys by electrolysis. A. BENEDETTI-PICHLER. *Z. anal. Chem.* 62, 321-9 (1923).—By using a Kuhlmann balance sensitive to 0.01 mg. and a procedure similar to that recommended by Pregl, it is possible to det. Cu fairly accurately by using only 2.5 cc. of soln. obtained

by dissolving 5-10 g. of sample in 30-40 cc. of concd. HNO₃ and diluting to 500 cc. Full details are given for carrying out the analysis. W. T. HALL

The determination of arsenic as triiodide, especially in mineral acids. O. NYDEGGER AND A. SCHAUS. *Bull. fed. ind. chim. Belg.* 2, 283-91 (1923).—The method of Blattner and Brasseur for detg. As in mineral acids is improved. From a soln. which is 4.3 N in H₂SO₄ and 6 N in HCl ppt. the As as AsI₃ by the addition of KI. Filter off the ppt. into a Gooch crucible and reject the acid filtrate. Wash the ppt. with water, dil. alkali to dissolve it and titrate with I₂ soln. R. BRUTNER

Determination of potassium by sodium cobaltinitrite. E. CLYFFERT. *Bull. soc. chim. belg.* 31, 417-20 (1922).—The cobaltinitrite method is said to be more accurate than the perchlorate method, and when carefully carried out gives results as good as those obtained by pptn. with chloroplatinic acid. The reagent is made up in two solns., viz., 28.6 g. of Co(NO₃)₂ and 50 cc. of glacial AcOH made up to 500 cc. with water and an aq. soln. of 180 g. of NaNO₂ in 500 cc. For use the Co soln. is slowly added to the NaNO₂ soln. 24 hrs. before the estn. to permit of the pptn. within that period of any K in the technical NaNO₂ used. An excess of the reagent is added gradually with mech. stirring to a soln. of the K salt (as concd. as possible) slightly acidified with AcOH; 40 cc. is required for 0.25 g. KCl in 25 cc. of soln., and in any case not less than 10 cc. of soln. is used. Stirring is continued for half an hr., and next day the ppt. is collected on a Gooch or tared filter, washed with dil. AcOH, and then with 95% alc., and dried at 120°. The ppt. contains 20.74% K₂O. J. S. C. I.

Quantitative determination of carbon and hydrogen in organic compounds with arsenic and with mercury. M. FALKOV AND GEORGE W. RATZISS. *J. Am. Chem. Soc.* 45, 998-1003 (1923).—Arsenicals can be analyzed by the Dennstedt method if a boat contg. Pb₃O₄ is placed immediately after that contg. the substance to be analyzed; the Pb₃O₄ reacts quant. with the As₂O₃, forming Pb arsenate which does not decomp. at high temps. and protects the Pt catalyst from being "poisoned." With mercurials, the catalyst is protected with a boat contg. silverized asbestos which amalgamates quant. with the Hg vapor; to prevent any carbonaceous matter from depositing on the Ag a small boat almost filled with a mixt. of Pb₃O₄ and sea sand is inserted between it and the substance to be analyzed. The Hg can be detd. at the same time as the C and H by measuring the increase in wt. of the silverized asbestos. C. A. R.

Determination of sulfur in organic compounds. WALTER F. HOFFMAN AND ROSS ALKEN GORTNER. *J. Am. Chem. Soc.* 45, 1033-6 (1923).—The Benedict-Denis method for detg. S in urine can be used to det. S in almost all kinds of org. compds. The failure to oxidize the S quant. in all compds. by this method is apparently not due to any particular type of S linkage but rather to the phys. properties of the compd. The method will not give accurate results with compds. which are volatile or sublime. For all other org. compds. it is believed it will serve as a simple, rapid and accurate method. C. A. R.

An estimation of the comparative concentration of strong and weak organic acids in a solution. R. GOIFON AND F. NEPVEUX. *Compt. rend. soc. biol.* 87, 1107-9 (1922).—Knowing the dissociation const. of the different acids the amt. of NaOH needed to change the *p*_H of the soln. to the point where it corresponds to the value of K can be calcd. Applying the method of Van Slyke and Palmer for prep. the Ca salts of the org. acids, the authors det. the amt. of 0.1 N HCl necessary to bring the mixt. to definite *p*_H points. The ratio of these vols. gives a measure of the relative proportion of each org. acid. S. MORGULIS

Determination of small quantities of oxalic acid and application of the method to determining oxalic acid in urine. J. KHOURI. *Compt. rend. soc. biol.* 88, 555-7 (1923).—The method depends upon the formation of an insol. urea oxalate. A soln. contg. (CO₂H)₂ is evapd. almost to dryness on a water bath and to this is added an alc. soln. of urea of known concn. The mixt. is again evapd. and the residue is extd. 3 times with ethyl or amyl alc. The urea content of the combined alc. exts. is detd. and the difference between the amt. added and recovered is the amt. used up in the formation of urea oxalate. In urine the detn. is carried out as follows: the acid is extd. by the usual method with ether; the ether is evapd. and the residue treated with 1 to 3 cc. of a 5% alc. urea soln. The rest of the procedure is the same as in the analysis of pure oxalic acid. The amt. of urea absorbed by the (CO₂H)₂ × 9/12 gives the amt. of oxalic in the amt. of urine analyzed. S. MORGULIS

Determination of formic acid. E. O. WHITTIER. *J. Am. Chem. Soc.* 45, 1087 (1923).—In the Jones method (*Am. Chem. J.* 17, 540 (1895)), at least 20 min. should be allowed for the completion of the oxidation. C. A. R.

Determination of formaldehyde in paraformaldehyde. P. BORGSTROM AND W.

G. HORSCH. *J. Am. Chem. Soc.* **45**, 1493-7(1923).—Of the 5 recognized methods (fixed alkali, iodimetric, peroxide, neutral sulfite and oxidation with KMnO_4 or $\text{K}_2\text{Cr}_2\text{O}_7$ in acid soln. and weighing of the CO_2) all except the first give results in substantial agreement with those obtained in the Leibig combustion furnace. C. A. R.

Detection and behavior of formaldehyde in cadavers. A. BRUENING. *Ber. pharm. Ges.* **33**, 99-103(1923).—A case is cited in which both CH_2O and CH_2O_2 could be detected in various tissues of a human cadaver after protracted immersion in H_2O . W. O. E.

Scopolamine poisoning and detection of scopolamine in the cadaver. A. BRUENING. *Ber. pharm. Ges.* **33**, 103-6(1923).—A case of criminal administration of the alkaloid, followed by some stupefying liquid (presumably $\text{C}_2\text{H}_5\text{Cl}_4$), in which the subsequent examn. developed the presence of a mydriatic alkaloid in the urine and liver, and of scopolamine itself in both stomach and contents. W. O. E.

Quantitative determination of acetic anhydride. G. C. SPENCER. *J. Assoc. Offic. Agr. Chem.* **6**, 493-7(1923).—A volumetric method is described for detg. Ac_2O (depending upon its conversion with PhNH_2 to PhNHAc , hydrolysis of the latter and titration of the regenerated PhNH_2 with $0.5\text{ }N\text{ KBrO}_3\text{-KBr}$) which applies equally well, as far as experience shows, to high and low concns. in AcOH . The estn. is readily effected without using unusual or expensive chemicals or app. The results obtained indicate for the method an accuracy within 1%. W. O. E.

The detection of hydroxylamine. W. M. FISCHER. *Chem.-Ztg.* **47**, 401(1923).—If to 1-5 cc. of a soln. suspected of containing NH_2OH 1-2 drops of 2.5% yellow NH_4 sulfide and 1-2 cc. of 10-25% NH_4OH are added, and the mixt. is shaken, a purple color will result if NH_2OH is present. The reaction is much more sensitive if 1-2 drops of 0.1 N Mn soln. is also added. As little as 0.00047 mg. of NH_2OH can be detected. The color is not very permanent but if more than 0.01 mg. of NH_2OH is present it can be obtained again by adding a little more $(\text{NH}_4)_2\text{S}_2$. The presence of Ni , Co , Fe , or Cr cations does not cause interference but Ca and some other ions do. Just what causes the coloration is not known. W. T. HALL.

The estimation of small amounts of alcohol and acetone in the air. RUDOLF SPATZ. *Arch. Hyg.* **91**, 315-6(1922).—The alc. from a sample of air is absorbed in a mixt. of 3 cc. 0.5 N $\text{K}_2\text{Cr}_2\text{O}_7$, 20 cc. 50% H_2SO_4 and 47 cc. H_2O . The mixt. is boiled 15 min. with a reflux condenser and then dild. to 200 cc. The unreduced chromic acid is detd. by adding KI to an aliquot portion and the liberated I titrated with $\text{Na}_2\text{S}_2\text{O}_3$. An aliquot portion of a similar 200 cc. mixt. but not exposed to alc. is treated in the same way. Each cc. of difference represents 1.15 mg. alc. There is an error of 2% and acetone does not interfere. Acetone in air is detd. by bubbling through a mixt. of 10 cc. of 0.1 N I soln. and 10 cc. 20% NaOH . When acetone is present iodoform is formed. The flask contg. the mixt. must be kept cold. The mixt. is acidified and the excess I titrated with $\text{Na}_2\text{S}_2\text{O}_3$. Every cc. of 0.1 N I soln. that disappears represents 0.964 mg. acetone. JULIAN H. LEWIS.

The determination of acetone and of ethyl alcohol in mixtures of the two. J. H. BUSHILL. *J. Soc. Chem. Ind.* **42**, 216-8T(1923).—In the study of the products of fermentation produced by different bacteria it was necessary to det. small quantities of acetone and alc. in the presence of one another. Satisfactory results were obtained by the following method: Make a measured vol. of the liquid slightly alk. and distil into a graduated flask. When about $\frac{3}{4}$ of the liquid has distd., make up to 200 cc. and det. the d. at 15.5° to 5 significant figures. Det. acetone by the Rakshit method (C. A. **10**, 2676). From these data tables are given which show how the acetone and alc. contents can be estd. W. T. HALL.

The determination of urea alone and in the presence of cyanamide by means of urease. E. J. FOX and W. J. GELDARD. *Ind. Eng. Chem.* **15**, 743-5(1923).—Fermentation of urea caused by urease always results in the formation of NH_4 carbonate and the NH_3 can be titrated with acid, methyl red being used as indicator. It is convenient to prep. the urease just before it is needed by extg. a few g. of jack-bean flour with 20 times its wt. of water. Ba and Ca inhibit the reaction with urea and must be removed as carbonates. After this the soln. should be made acid, CO_2 removed by aeration and the urease added to the exactly neutral soln. Ten cc. of neutral urease soln. causes the complete decompn. of 0.5 g. urea in less than 1 hr. W. T. HALL.

Electrometric titration of reducing sugars. WANDA L. DAGGETT and A. W. CAMPBELL with J. L. WHITMAN. *J. Am. Chem. Soc.* **45**, 1043-5(1923).—A rapid method is described for the volumetric detn. of reducing sugars with Fehling soln., the end point being detd. electrometrically, whereby the uncertain personal element is eliminated. The method, as checked gravimetrically, is accurate. No work has yet been done on

the detn. of very small amts. of reducing sugars or upon the effect of the presence of large quantities of other sugars, such as sucrose. C. A. R.

Determination of sucrose by means of the alkaline earth hydroxides. A. BEHRER AND A. DÖRING. *Z. Nahr. Genussm.* 45, 158(1923); cf. C. A. 16, 4158.—Polemical. D. B. DILL

KAMM, OLIVIER. *Qualitative Organic Analysis*. London: Chapman and Hall, Ltd. 260 pp. 12s. 6d. Reviewed in *Chem. Trade J.* 72, 643(1923); *Chem. News* 126, 414.

8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND EDW. F. HOLDEN

Minerals from the burning coal seam at Mt. Pyramide, Spitsbergen. IVAR OFTE-DAL. *Resulater Norske Statsund. Spitsbergeneksped. Kristiana* 1, (No. 3) 9-14(1922); *Mineralog. Abstr.* 2, 10.—The following minerals were found near holes from which smoke issued: S crystals, sal-ammoniac [forms (100) and (211)], needles of $C_{16}H_8O_8$, *hoeelite* (anthraquinone) which has sp. gr. 1.43, α and β near 1.75, γ - α 0.3. E. F. H.

Studies on the dolomite system. I. The nature of dolomite. A. E. MITCHELL. *J. Chem. Soc.* 123, 1055-69(1923).—Dissociation pressures of calcite, magnesite, and dolomite are different and definite; that of calcite being least, of magnesite greatest. It is concluded that the thermal dissociation of dolomite is represented by $CaCO_3 \cdot MgCO_3 \rightleftharpoons CaO \cdot MgO + 2CO_2$. The thermal dissociation of calcite follows the Nernst equation. The sp. heats of magnesite and the solid decompn. product of dolomite are, respectively, 0.2033 and 0.2101 cal. at 15-20°. The heats of soln. of dolomite and its solid decompn. product in HCl have been detd., and the heats of formation of the 2 substances from their elements calcd. It is yet impossible to decide whether dolomite is a singular point in a series of solid solns. or a compd. E. F. H.

A chemical study of dolomites. N. KNIGHT. *Proc. Iowa Acad. Sci.* 28, 37-45(1921); cf. C. A. 15, 3601.—K. reports analyses of specimens of dolomites, so-called, from a number of different countries, and states that some are properly termed dolomites, while others are Mg-limestones, with only a small % of Mg. Some contain very little of either Ca or Mg, but are sandstone. W. G. GAESSLER

The formation of emery observed at an occurrence of corundum rock in Uruguay. K. WALTHER. *Z. deut. geol. Ges.* 73, 292-338(1922); *Mineralog. Abstracts* 2, 12.—A corundum rock occurring with cordierite-hornfels and phyllite at Cerro Redondo, near Minas, is petrographically and chemically described. It contains a mineral regarded as monoclinic and dimorphous with diaspore, named *kaysierite*. Theories of the origin of emery are reviewed, and a pneumatolysis of sedimentary rocks by AlF_3 is suggested. E. F. H.

The prochlorites of the corundum-bearing rocks. J. ORCEL. *Compt. rend.* 176, 1231-4(1923).—The corundum deposits on the eastern coast of the U. S. are always associated with phyllites in which chlorites of rather constant compn. are prominent. Among them corundophilite, $SiO_2/R_2O_3 = 1.5$, and amesite, $SiO_2/R_2O_3 = 1$, contain the highest % of Al. Analyses of specimens from N. C., Pa. and Ga. are quoted. Analysis by O. of a specimen from the Carter Mine, Madison Co., N. C. gave: SiO_2 27.35, TiO_2 trace, Al_2O_3 25.3, Fe_2O_3 0.53, FeO 5.19, MnO trace, MgO 29.91, H_2O -0.08, H_2O +12.09, sum 100.45%. From the optical properties and chem. compn. the prochlorites may be divided into 2 groups: (1) the ferruginous or *ripidolites* defined by the ratio $MgO/FeO = 3$ or less, and a feeble birefringence (0.001 to 0.005); (2) the magnesian for which the ratio $MgO/FeO =$ about 10 and the birefringence about 0.01. The name *grochaultite* is suggested for this group. L. W. RIGGS

The system $CaCO_3$ - $NaAlSi_3O_8$ (calcite-nephelite) and cancrinite. W. EITEL. *Neues Jahrb. Mineral. Geol.* 1922, II, 45-61.—E. continued the investigation begun by Boeke (C. A. 6, 3254) using the same app., except modifying the oven as follows: The external Pt wire coil was replaced by an internal one. The wire spiral was laid on a $1/4$ mm. magnesia or marquardt base which was made strong by dipping the just solidified marquardt base in a bath of concd. Th nitrate in a crucible, and raising to the glowing point. A firm, hard base resulted not over $1/2$ mm. thick. Care had to be taken in sealing the app. He cemented the magnesia stopper of the crucible directly to the oven orifice with marquardt cement, applied in a pasty condition. The thermo-element was securely fixed through a cork, so that it was firm, and short circuiting was impossible. Expts. were performed under pressures of 100-110 kg/cm.² (see Table 1).

He prepared the synthetic nephelinite as Bowen did (C. A. 6, 587). Heating was done carefully so that no dissociation of CaCO_3 occurred. E. found a eutectic at 1190° between the CaCO_3 and the compl. 3 nephelite. CaCO_3 (written $3\text{Ne}.\text{CaCO}_3$). This compd. melts at 1253° . Mixts. from 0 to 75% nephelite formed cryst. products after being maintained at a temp. just above liquefaction and allowed to cool slowly. The products were studied under the petrographic microscope. $3\text{Ne}.\text{CaCO}_3$ deviates from cancrinite in having its n s higher: $\omega = 1.550$, $\epsilon = 1.519$. In a mixt. contg. more nephelite than the theoretical amt. in cancrinite the product only sintered and showed no cancrinite, although the structure and the break in the melting curve at 1253° showed that cancrinite had formed, but was resorbed. Expts. at pressures of 65 kgcm.² were similar, but under lower pressures there was much decompn. of the CaCO_3 , but no cancrinite formed. Weakly doubly refracting crystals were present, with $N = 1.54$, and + elongation; E. calls them anorthite. [Probably an intermediate plagioclase. ABSTRACTOR.] It is concluded that if an alk. magma in contact with a limestone is heated above 1253° and is under a pressure of at least 65 kgcm.² cancrinite will result as a primary mineral of the igneous rock. If the pressure is lower the assimilation of limestone will result in the development of anorthite. The old idea that cancrinite forms by alteration of nephelite at low temp. and pressure is held as unbelievable.

TABLE I.

No.	% Products CaCO_3	Neph.	M. p.	Eutectic.	Pressure kgcm. ²	Remarks.
1	100	—	1290 ^a	—	115	Homogeneous product
2	85.86	14.14	1280	about 1180°	110	Much calcite, a little cancrinite
3	50	50	not detd.	between 1180 and 1190	105	same
4	47.94	52.06	1233	1190	106	Much cancrinite between primary calcite
5	25	75	1230	1195	105	Primary cancrinite, calcite in groundmass
6	10.43	89.57	about 1250	1220?	100	Only sintered; absorbed cancrinite
7	18.98	81.02	1253	1190	115	Melted, absorbed the cancrinite

A diagram of these data is given.

Thalenite from Hundholmen in northern Norway. T. VOGT. *Vid.-Selsk. Skriftr.* Kristiana I. Mat.-Nat. Klasse, No. 1, 17-47(1922); *Mineralog. Abstracts* 2, 25.—Thalenite is found for the first time outside of Sweden, in pegmatite at Hundholmen. When fresh the crystals are reddish violet and transparent, but they are often altered on the surface to tenerite. It is monoclinic, $a:b:c = 0.9190:1:0.6480$, $\beta = 82^\circ 54.5'$; 23 forms are noted. The optical characters vary somewhat, $\beta = 1.736$. Sp. gr. 4.454, hardness = 6-6.5. Analysis gave: SiO_2 29.76, Y_2O_3 (with some Ce_2O_3 and traces of Fe_2O_3 , Al_2O_3 , and BeO) 64.34, H_2O 0.75%. The formula is therefore $\text{Y}_2\text{Si}_2\text{O}_7$.

E. F. H.

Thortveitite, gadolinite, kainosite, and orthite. J. SCHRETLIG. *Vid.-Selsk. Skriftr.* Kristiana I. Mat.-Nat. Kl., No. 1, 49-138(1922); *Mineralog. Abstracts* 2, 25.—The literature is summarized, and details of occurrences and characters are given for these minerals. A history of Sc is added. Two new analyses of gadolinite are given. One has high Ce_2O_3 , 23.40%.

E. F. H.

Supplement to volume 1, niobates, tantalates, titanates, and titanoniobates. J. SCHRETLIG. *Vid.-Selsk. Skriftr.* Kristiana I. Mat.-Nat. Kl., No. 1, 139-48(1922); *Mineralog. Abstracts* 2, 25-6.—Supplementary notes on fergusonite, ilmenorutile, columbite intergrown with samarskite, euxenite, and *priorite* (with analysis). Risörite and "höggtveitite," e. g., alvite, are also discussed.

E. F. H.

Descloizite from S. W. Africa. P. A. WAGNER. *S. African J. Sci.* 19, 142-5 (1922).—The specimens studied were from Olifantsfontein West, and Abenab, situated 12 miles N. W. of Grootfontein North. The crystals from the first locality range up to 1.72 cm. along the c axis. They are of dark olive-green color with brilliant luster. On a fractured surface the color is orange brown, the fracture being uneven; the streak is pale yellow. Cleavage parallel to (100) is imperfect. Under the microscope they show a well developed zonal structure of alternate thick greenish and thinner brown or yellow layers, both strongly pleochroic. Analysis by McCrae gave: PbO 55.45, ZnO 15.5, CuO 3.8, Fe_2O_3 0.3, V_2O_5 22.0, H_2O 2.5, H_2O (110°), 0.05, sum 99.6%; sp. gr. = 6.2.

The associated minerals are pellucid bluish white quartz and calcite. The Abenab ore occurs in at least 4 varieties varying in color from dark green to chrome brown. Analysis of a composite sample of the 4 varieties gave: PbO 51.81, ZnO 18.06, CuO 1.1, V_2O_5 20.60, P_2O_5 0.08%. Chemically the several varieties differ mainly in their Cu content.

Argentojarosite, a new silver mineral. W. T. SCHALLER. *J. Wash. Acad. Sci.* 13, 233(1923).—This mineral was found in the Titanic Standard mine at Dividend, Utah. It forms small hexagonal scales of a yellow to brown color and optically is uniaxial and negative. The av. of several analyses gave: Ag_2O 18, Fe_2O_3 43, SO_3 28, H_2O 10; formula thus $Ag_2O.3Fe_2O_3.4SO_3.6H_2O$. A small amt. of K_2O and PbO is present. L. W. RIGGS

The geology of the Otravaara ore-field. M. SAXÉN. *Meddel. Geol. Fören. Helsingfors* 1919–20, 17–21(1921); *Mineralog. Abstr.* 2, 10.—Pyritic masses (of pyrite and pyrrhotite with other minerals) occur at the contact between a gabbro boss and amphibolites, in Eno parish. Analyses of the rocks are given. A yellow earthy basic Fe'' sulfate is formed by surface weathering. It has the formula $Fe_2O_3.SO_3.3H_2O$, and the name *borgströmite* is proposed for it. E. F. H.

Meteorites fallen in Catalonia. M. FAURA Y SANS. *Bull. Centre Excursionista de Catalunya*, Barcelona 31, 270–88(1921); *Mineralog. Abstr.* 2, 36.—Four meteoric stones are described in detail (in Catalan), with analyses and photomicrographs. Other, doubtful, falls are mentioned. E. F. H.

Ontario gold deposits. Their character, distribution and productiveness. P. E. HOPKINS. *Ann. Rept. Ont. Bur. Mines* 30, pt. II (for 1921) 73 pp.(1922); *Mineralog. Abstr.* 2, 30–1.—Includes a history of the Pt production since 1806, statistics, descriptions of the different fields, discussion of the ore reserves, and numerous references to the literature. The productive areas are entirely in pre-Cambrian rocks. Five mineralogical types of deposits are to be recognized: (1) pyrite-Au-quartz, (2) arsenopyrite-Au-quartz, (3) Au tellurides, (4) calcite-Au and (5) Cu-Ni-Au. E. F. H.

Geology and ore deposits of the Yanahara mining district, province of Mimasaka, Japan. TAKEO KATO. *Japan J. Geol. and Geogr.* 1, 77–116(1922).—The principal metallizations in this district were accomplished during or following the intrusions of a granitic magma, which had been preceded by eruptions of a diabase-gabbroic magma and were succeeded, with a slight time interruption, by enormous effusions of the liparite lava and the minor intrusions of an intermediate rock magma represented by augite-porphyrite. The pyritic ore deposits were formed by replacement of various rock types. The mineralization in the earliest stage was at comparatively high temp., which followed the stage of extensive contact metamorphism of the country. The main mineralization was accomplished by hydrothermal solns. at temps. but a little below the critical point of H_2O . A table shows 10 stages of mineralization with the deposits of non-metallic or metallic minerals, or both, for each stage. L. W. RIGGS

On the origin of petroleum. E. PYHÄLÄ. *Petroleum Z.* 19, 495–9(1923); cf. C. A. 17, 372.—The work of Mendelejeff, of Moisson and of other investigators on the carbide theory of formation of petroleum hydrocarbons are reviewed and lab. expts. are described which tend to support the theory. D. F. BROWN

Chemical origin of petroleum. ANON. *Oil & Gas J.* 22, (No. 1) 101(1923).—Ni was found in various petroleum in amts. of 1–93 p. p. m. and in Trinidad asphalt 194, California gilsonite 133, and U. S. petroleum pitch 240 p. p. m. V has also been found in petroleum. It is suggested that the occurrence of these metals may signify their use as natural catalysts in the formation of petroleum by hydrogenation. D. F. B.

Geological observations from the analyses of special Galician petroleum. K. FRIEDL. *Petroleum Z.* 19, 452–4(1923).—The following facts concerning petroleum occurrence in the Carpathians are summarized: If petroleum occurs in large amts. in the upper strata it is to be expected in the lower strata in smaller amts. The chem. nature of both oils is similar, but the deeper oil is always heavier, richer in paraffin and more deficient in gasoline. D. F. BROWN

California natural gas of vegetable origin. C. ELSCHNER. *Petroleum Z.* 19, 56–7(1923).—A detailed description of the geological formations in the Owen's Lake region, Cal., is given and comparison made with the Cretaceous formations where oil, gas and asphalt are found in Egypt, Syria and Palestine. Three distinct clay layers are found in this region, sep'd. by respective layers of sand, all of which yield gas. The gas is almost pure CH_4 and contains no H_2S . D. F. BROWN

Blowouts in Belgian coal seams. F. C. CORNET. *Coal Age* 23, 367–72(1923).—The frequent blowouts from coal seams in Belgian coal mining are explained by Morin's theory of coal expansion and Ruele's hypothesis of methane polymerization. In the former expansion results from the release of CH_4 held in the coal under high pressure.

The latter relates to the occurrence of the CH_4 in special form due to high pressure as the coal was geologically formed.

Special gases over the hot spring Nasu. KEIICHI SHIKATA. *J. Pharm. Soc. Japan* No. 490, 1067-74(1922).—This is one of 10 springs located around Nasu volcano. It has a strong acid reaction and gives off an H_2S odor. Within a few blocks, there are enclosed rocks, called death rocks, which are known to kill human beings and animals. Analysis of gases over the rocks shows H_2S 0.15–33.10%, CO_2 0.255–15.40% and small amts. of AsH_3 , the variations depending on the time and place. Over the spring (spring 76° and the air 74°), S. found 10.87–11.46% H_2S and 7.91–8.85% CO_2 , but no AsH_3 . The spring itself contains As. Death must be due to H_2S and CO_2 , rather than AsH_3 , since it requires at least 25 hrs. to breathe in its toxic dose (1 mg.) from the worst gas found at this place.

Causes of the earth's contraction. R. A. SONDER. *Vierteljahrsschr. Naturforsch. Ges. Zurich* 67, 177–89(1922).—The folded appearance of the earth's surface is concluded not satisfactorily explained by cooling. In the sun and fixed stars, the possible evolution of matter from simpler elements, accompanied by release of atomic energy, gives a direction for the problem to be considered. A discussion is given, including much chem. data.

E. T. ERICKSON

Cretaceous shales of Manitoba and Saskatchewan (ELLIS) 22. Iridescent color—Labrador feldspar (RAYLEIGH) 2. Structure of ZnO (WEBER) 2. Crystal structure of several oxides (NIGGLI) 2. Use of the oxy-acetylene blowpipe in spectrum analysis (DE GRAMONT) 7. Crystallographic examination of several organic compounds (BEGGER) 10.

9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, R. S. WILLIAMS

William Brady. L. P. CHASE. *Ind. Eng. Chem.* 15, 760(1923).—An obituary, with portrait.

Elie Reumeaux (1838–1922). LÉON GUILLET. *Rev. métal.* 20, 339–40(1923).—An obituary with portrait.

Flotation in the Slocan District, B. C. J. P. MACFADDEN. *Eng. Mining J.-Press* 114, 677–81(1922).—The ores treated are Ag-Pb-Zn ores. The Pb concentrate runs 100–175 oz. Ag, and the Ag is present in such a form that by sliming it is freed and difficult to save. The ore is not, therefore, very finely ground so that a concentrate running 55% Pb and 10–12% Zn is made. The flotation units are operated on a feed of 1.5–2.5% Pb, 10–15% Zn and 25–30 oz. Ag. By oiling with cresylic acid a concentrate running 40–45% Pb, 25–30% Zn and 200–300 oz. of Ag was made.

Sodium sulfide as a differential flotation agent. J. B. PARKER. *Eng. Mining J.-Press* 114, 629(1922).—The use of Na_2S to float galena preferentially in mixed Pb-Zn ores is described. It is suggested that controlling the amt. of Na_2S brings into play 3 factors: (1) by using a limited amt. of reagent the galena is free to absorb oil, (2) a sulfidized mineral requires a more intense flotation condition than one that is not, and (3) surface tension is changed and the change has a delaying effect on the flotation of sphalerite.

Work of the Ore Dressing and Metallurgical Division of Canadian Department of Mines. General review. W. B. TIMM. *Can. Dept. Mines, Summary Rept.* 1921, No. 586, 78–204(1923).—Research work was done upon the methods of flotation, milling ore dressing, and recovery of precious metals. The exptl. work was generally done first on a lab. scale with 500 to 1000 g. of ore, then on a large scale with approx. a ton of ore, by means of modern machinery and modern reagents. A list of the investigations follows: (1) Low-grade Cu ores of Hidden Creek, Anyox, B. C. (2) Flin Flon complex sulfide ore. (3) Concn. of graphite from the N. Am. mine. (4) Concn. and sepn. of the minerals in the Pb-Zn-Ag ores of Kimberly, B. C. (5) Comparative tests on the Co-Ag sand tailings. (6) Milling of asbestos rock. (7) Concn. of the lower-grade Cu-Ni ores. (8) Concn. of garnet from its rock. (9) Recovery of brass from foundry refuse. (10) Metallurgical treatment of Au ores from the Rice Lake district, Man. (11) Concn. tests on some Mo ores. (12) Recovery of values in a Ag-Pb ore from Arrowhead, B. C. (13) Concn. of the radioactive mineral euxenite. (14) Uses of flotation reagents manufactured in Can. (15) Recovery of metals of the Pt group from placer concentrates.

L. W. RIGGS

The new magnetic concentrating mill at the Richard iron mine, New Jersey. II.

H. M. ROCHE. *Eng. Mining J.-Press* 115, 971-5(1923); cf. *C. A.* 17, 2408.—A new type of wet-belt magnetic separator is used, and data are given showing its superiority over the old dry type. Ore in passing from magnet to magnet is turned over and over while being washed with water, which prevents non-magnetic material from being entrained with the concentrate. A voltage regulator on the magnets is also a special feature. The mill costs are detailed, showing the low total of 27 cents per ton of ore treated.

A. BUTTS

Lead smelting practice at the Port Pirie works of the Broken Hill Associated Smelters Pty. Ltd. O. H. WOODWARD AND J. C. HUGHES. *Proc. Australasian Inst. Mining Met.* 1922, No. 47, 122-201.—The plant has five large blast-furnaces smelting a charge averaging 97.5% sinter ($\frac{1}{3}$ Dwight-Lloyd, $\frac{1}{3}$ Huntington-Heberlein) and 2.5% flux, besides returned slag equal to 22.5% and coke 12% of the charge proper. The returned slag gives better slag-flow, counteracts hot top, and keeps the charge open. There is also a small furnace treating Cu dross and Sb slag. A complete detailed description of equipment and methods is given, including furnaces and accessories, organization and record sheets, sampling and assaying, handling, analyses, and preparation of materials, bullion and slag, slag granulation, furnace accretions and repairs, turbo blowers, and bag-house, with 28 diagrams.

A. BUTTS

The determination of dust losses in metallurgical processes, as practiced at the Port Pirie works of the Broken Hill Associated Smelters Pty. Ltd. A. J. HEMINGWAY. *Proc. Australasian Inst. Mining Met.* 1922, No. 47, 237-44.—A description of standard methods, aspirating small amts. of gases and using filter-thimbles.

A. BUTTS

The practice of de-silverizing base bullion at the Port Pirie works of the Broken Hill Associated Smelters Pty. Ltd. W. H. CAMPBELL. *Proc. Australasian Inst. Mining Met.* 1922, No. 47, 221-8.—Operating details are given; the Parkes process is used.

A. BUTTS

The metallurgical treatment of zinc retort residues. B. M. O'HARRA. U. S. Bur. Mines, *Repts. Investigations* No. 2475, 12 pp. (1923).—Methods available may be thus classified: (1) Smelting in Pb blast-furnace. (2) Burning or sintering to remove C and some Zn, followed by (1). (3) Dry screening, with the object of recovering coke, concg. the residues in Pb and Ag, or both. (4) Magnetic concn. (5) Wet concn. for recovery of Pb, Au and Ag, or for recovery of Zn and coke. (6) Burning on Wetherill grates for ZnO. (7) Miscellaneous (chiefly leaching). (1) is often done when the residue contains enough Cu, Pb, Ag, and Au; usually mixed with main charge in small amts. (2) has been done in large slow-burning ventilated piles, and on Dwight-Lloyd machines. (3) Coke recovered on 6-mesh screen is used as reduction fuel in new retort charge, or fuel for Wetherill grates, or burned under boilers; this method has been a success at some plants, a failure at others. (4) A test at the Salt Lake station of the Bureau of Mines eliminated over 50% of the Zn and 95% of the C in a tailing representing 62% of the charge. (5) Jigging has long been practiced to enrich residues in Pb and Ag, while recovery of Zn and coke has been successful in some plants, but more often unsuccessful. (6) is common practice, though the ZnO is apt to be of lower quality. (7) includes suggested methods only. Old retorts and condensers are crushed and coned, with jigs or tables, the concentrate being mixed in new retort charges and the tailings used for reclaimed clay.

A. BUTTS

The bursting of steam boiler tubes during use. WALTER RITTER. *Feuerungstechnik* 11, 39(1922).—The martensitic structure at the point of rupture showed that the tube had been heated at some time to above 700° and suddenly cooled. Contributory causes were corrosion by SO₂ and uneven wall thickness.

ERNEST W. THIELE

Hardness. C. A. EDWARDS AND C. R. AUSTIN. *J. Iron Steel Inst.* (advance proof) 18 pp.(May 1923).—There does not appear to be any simple relationship between the rebound method of measuring hardness and Brinell's static method. As the height of fall increases, there appears to be some reason for considering that there might be a linear relationship between the rebound and Brinell values. A simple relationship between Brinell values of different metals, and heights of rebounds obtained from heights of fall or energy of impact yielding a const. amt. of deformation, has been obtained.

V. O. HOMERBERG

Hardness and hardening. WALTER ROSENHAIN. *Chem. Met. Eng.* 28, 899-901 (1923).—A synopsis of a lecture given at various localities during a recent American tour. Parallel phenomena are found in many alloy systems which help to explain why steel is hard.

V. O. HOMERBERG

Experiments on the hardness and spontaneous annealing of lead. A. I. NORBURY. *Trans. Faraday Soc.* (advance proof) 1923.—Part I contains a description of an adaptation used for making low-load Brinell impressions with a lever tensile machine.

Part II considers the Brinell hardness tests on Pb using various loads for various lengths of time. Part III gives the effect of cold-hammering on the hardness of Pb. Pb is hardened by cold-work, and, within certain limits, the greater the amt. of cold-work the greater the hardening. Pb is spontaneously annealed at room temp. The rate of annealing increases with the amt. of deformation, and this introduces the interesting result that Pb that has been severely hammered shows no increase in hardness. The severe deformation in this latter case has caused such rapid annealing that the Pb is dead soft 20 sec. after hammering. Curves are given, which show tendencies to form small maxima. These are probably indicative of the fact that when a cold-worked metal is annealed there is usually a small rise in hardness before the main fall commences.

V. O. HOMERBERG

Variation of Brinell hardness number with testing load. H. O'NEILL. *J. Iron Steel Inst.* (advance proof) 28 pp. (May 1923).—The curve showing the relationship between the indenting load and the resulting Brinell no. commences at the origin and rises steeply at first. It then flattens out and passes through a max., subsequently falling until the ball is embedded in the specimen. The Brinell no. is the sum of 2 terms, the second of which is equal to the first multiplied by a factor. This factor decreases in value from 1.0 to 0 as the testing load increases over the range of the test. Up to the max. in the load hardness curve this factor is of such a value as to permit of the following approx relation: $H = KL^2$. The curve ends when the ball is immersed up to its diam. in the metal. The Brinell no. and load corresponding to this point have been called the "ultimate hardness" and the "ultimate load," resp. There is a linear relation between the 2 for all metals. The harder the material the higher the max. value of the Brinell no. and the greater the load at which it occurs. Viscous materials obey Meyer's formula and have a value for n of 2.0. Their Brinell no. is a max. when L is 0, and decreases as the testing load increases. The effect of cold-work upon a metal is to raise the max. Brinell no. and to decrease the value of the load at which it occurs. The "ultimate hardness" and the "ultimate load" appear to remain const. It is probable that after a certain amt. of deformation in the cold the rigidity of a metal decreases.

V. O. HOMERBERG

Correlation of the chemical constitutions of "true steels" with their micrographic structures. J. O. ARNOLD. *J. Iron Steel Inst.* (advance proof) 1923, 8 pp.; *Engineering* 115, 699-700.—True steels may be defined as "satd. steels"—steels contg. neither structurally free Fe nor structurally free metallic carbides. True Fe steel consists entirely of allo-trimorphic crystals of the compd. micro-constituent "Fe pearlite." In true V steel, Fe contg. 0.9% C and a little over 2.3% V yielded a mech. mixt. of the carbides of Fe and V with the formula $2Fe_3C + V_4C_3$. When approx. 4.8% V was present, Fe_3C was practically absent and only the single carbide V_4C_3 was found. This result was const. up to 13.5% V. Fe contg. say 4.75% V constitutes V pearlite or true V steel, the constitutional formula of which is $Fe_{72} + V_4C_3$. In true W steel there is a displacement point of all Fe_3C when the W reaches a little above 11% and the carbide WC is formed. If a little less than 0.75% C is present, it is entirely appropriated by the W. Should the added W be well under 11%, the mixed carbides ($xFe_3C + yWC$) are obtained. A tungstide of Fe (Fe_3W) is formed when the W content exceeds 11%. W pearlite is a triad substance ($Fe_{24} + WC$) contg. the 3 elements Fe, W and C. The crit. displacement point for true ferro-Mo steel is at approx. 18.2% Mo and approx. 0.75% C. The formula of ferro-Mo pearlite is $Fe_{24} + Fe_3Mo_3C$. Near the crit. chem. points Fe_3C vanishes and is replaced by a ferro-Mo double carbide true steel. No evidence was obtained of the production of true steels by the metals Cr, Co, Mn, and Ni even up to 24% of the added element.

V. O. HOMERBERG

Some properties of steels containing globular cementite. C. H. DESCH AND A. T. ROBERTS. *J. Iron Steel Inst.* (advance proof) 1923, 11 pp.—The work described was undertaken to det. certain properties of high-C steels in which the cementite has been brought completely into the globular condition by combined thermal and mech. treatment. The first section deals with the effect of heat treatment on a C steel (1.28% C) slowly cooled from the molten steel, and heated under such conditions as to produce globular cementite. Mech. tests of the same steel in 3 different states were also made, together with hardness and impact tests of steels of lower C content for purposes of comparison. The second part describes expts. on the steels used in the manuf. of safety razor blades, with an account of the factors which det. their efficiency.

V. O. H.

Behavior of certain steels under impact at different temperatures. F. C. LANGENBERG. *J. Iron Steel Inst.* (advance proof) 34 pp. (May 1923); cf. C. A. 17, 840.—The investigation was undertaken to det. the differences in the amt. of energy absorbed in fracture by dynamic stress, or the differences in resistance to impact, which are exhibited

by certain representative steels when they are subjected to different temps. A Charpy impact testing machine was used. Also in *Engineering* 115, 788-90(1923).

V. O. HOMERBERG

Cold-working of steel with reference to the tensile test. JOHN STEAD. *J. Iron Steel Inst.* (advance proof) 39 pp.(May 1923).—The expts. were undertaken with the object of finding some relation between tensile strength of wire and that of the steel from which it was drawn. No definite relation was found, but some interesting results from the point of view of cold-working generally were obtained. The expts. were to obtain the true stress-strain diagram from yield point to fracture of steel undergoing the ordinary tensile test, and from it to derive an equation connecting stress and strain.

V. O. HOMERBERG

Mechanical properties of a series of chromium steels. CHARLES R. AUSTIN. *J. Iron Steel Inst.* (advance proof) 1923.—The effect is given of heat treatment on the mech. properties of a series of Cr steels, consisting of 2 groups contg. approx. 0.35 and 1% C, resp., the Cr content varying from 2 to 12%.

V. O. HOMERBERG

The nature of the A_1 transformation in carbon steels. K. HONDA. *Sci. Repts. Tohoku Imp. Univ.* 11, 487-500(1922).—See *C. A.* 16, 2293.

F. P. FLAGG

Izod impact test. J. H. ANDREW AND ROBT. HAY. *J. West Scotland Iron Steel Inst.* 30, 48-51(1923).—C steels low in Mn were abnormally treated to produce distinctive microstructures, so that these might be correlated with the impact figures. The results are considered in detail. Photomicrographs are included.

V. O. H.

Changes in iron and steel below 400°. F. C. THOMPSON AND A. GOFFEY. *J. Iron Steel Inst.* (advance proof) 24 pp.(May 1923).—Contemporary literature has been shown to afford evidence of abnormalities in the behavior of Fe and steel at temps. below the C-change point. Measurements of elec. resistivity and torsional elastic limit have shown the existence of a no. of change points at 70°, 120°, 170°, 230°, 290°, 310° and 350°, small in the elec. resistivity, but very striking in the elastic properties, in low- and high-C steels and in electrolytic Fe. A theory has been deduced to explain these changes as due to alterations in the structure of the Fe atom.

V. O. HOMERBERG

Quenching of carbon steels. TOKUJIRO MATSUSHITA. *J. Iron and Steel Inst.* (advance proof) 18 pp.(May 1923); *Science Repts. Tohoku Imp. Univ.* 12, No. 1, 7-25.—The lowering of the A_1 point in steel depends not only on the velocity of cooling, but also to a considerable degree on the C content. In a high-C steel the A_1 transformation, when quenched in H_2O , begins to take place at a temp. approaching that of the medium; but, when quenched in oil, it takes place partially at a higher temp. In a low-C steel the transformation occurs at a somewhat higher temp. even with the H_2O quenching. If this change takes place above 400° the steel is not hardened; if it occurs between 300° and 400° the steel contains β -martensite only, but below 300° it contains both α - and β -martensites. There are 2 special points with regard to the lowering of transformation, 550° and 350°. From the 1 to the other there is always an abrupt fall of the transformation point. If the transformation of steel occurs above 550° the steel has a sorbitic or pearlitic structure, in the vicinity of 400° a troostitic, and below 350° a martensitic structure. In oil quenching, repeated quenches increase somewhat the hardness of steels. A method of uniform quenching is to quench steels first in H_2O and then below 350° in an oil bath.

V. O. HOMERBERG

The magnetic hardness of quenched steels. TOKUJIRO MATSUSHITA. *Sci. Repts. Tohoku Imp. Univ.* 11, 471-85(1922).—The magnetic hardness, i. e., the coercive force, is a better measure of the effect of quenching than any other test. The proper quenching temp. to obtain max. magnetic hardness decreases with increasing C content up to 0.8% C and then increases. Quenching from below 850° into oil the hardness is much less than quenching into water, but from above 900° quenching into oil gives a little greater hardness than quenching into water. A second quenching in oil from the same temp. gives a much greater hardness than the first quenching and almost as great a hardness as water quenching. Oil quenching generally produces with alloy steel a greater hardness than water quenching.

F. P. FLAGG

Influence of cooling rate on properties of carbon steel. F. B. FOLEY AND J. WINLOCK. *Chem. Met. Eng.* 28, 502(1923).—The deduction may be made from the expts. that ductility and toughness in hypo-eutectoid steels are products of free ferrite, fine crystal structure in both the pearlite and the ferrite binder, and homogeneity in chem. compn.

V. O. HOMERBERG

Effect of small quantities of tin in steel. J. H. WHITELEY AND A. BRAITHWAITE. *J. Iron Steel Inst.* (advance proof) 9 pp.(May 1923).—Exptl. evidence is advanced showing that the presence of small percentages of Sn in medium-C steel is likely to impair seriously its ductility, so that in rails even 0.06% may be unsafe. The harmful effect

of Sn apparently increases with the C content, for in mild steel the above amt. has, apparently, no detrimental effect. The degree of brittleness produced by Sn appears to be influenced also by the heat treatment given; also, factors such as the finishing temp. and the amt. of work applied to the metal in rolling or forging must not be overlooked.

V. O. HOMERBERG

Change of density of iron due to overstrain. J. W. LANDON. *J. Iron Steel Inst.* (advance proof) 7 pp. (May 1923).—The change of d. was detd. for different angles of twist. The max. decrease of density due to overstrain for the material used was nearly 2%.

V. O. HOMERBERG

Information regarding the "ageing" of cold-worked iron. O. BAUER. *Mitt. Materialprüfungsamt* 39, 251-4.—The brittleness of specimens of ingot Fe reduced in thickness by compression and left at room temp. increased, at first, rapidly and then more slowly. After 360 days the degree of brittleness had not reached a max., since specimens after this time tempered at 250° for 2 hrs. became more brittle. F. P. F.

The economical production of conductivity bronze. S. LEDERMAN. *Z. Metallkunde* 15, 74-7, 98-102 (1923).—The increase in the amt. of Mg added to melts of bronze, to be used for the manuf. of wire conductors, from 0.07 to 0.09% increased the percentage of lots that passed the specifications from 35.7 to 76.7. F. P. FLAGG

Etching aluminium bronze. J. STRAUSS. *Chem. Met. Eng.* 28, 852-3 (1923).—The surface film is first removed by immersing the specimen in 10% HF in H₂O for 2 to 5 sec., washing in cold H₂O and then quickly transferring to the desired etching soln. This latter soln. may be a mixt. of HNO₃ and H₂CrO₄ of varying strength, an acid soln. of FeCl₃, NH₄OH - H₂O, HNO₃ in H₂O or NH₄OH + stream of O₂. The formulas of these etching reagents as well as photomicrographs are given. V. O. HOMERBERG

The kinetics of the transformation in quenched α,β -brass. W. FRAENKEL and H. BECKER. *Z. Metallkunde* 15, 103-5 (1923).—The curve representing the rate of change of cond. of an alloy of Cu and Zn in the β condition during annealing at a const. temp. appears similar to that representing the velocity of a homogeneous chem. reaction. The measurement of the velocity of the change of β into α crystals in quenched specimens of a brass contg. 58.6% Cu did not give enough information to permit the comparison of the velocity with the rate to be expected if the change occurs with the speed indicated by the equation for the velocity of a homogeneous chem. reaction, because the constitution of the alloy at any moment could not be detd. from the cond. measurements. The velocity is not influenced by the length of time the specimen is held at the quenching temp. It appears to be a little higher for specimens quenched from above 800° and to increase with the degree of quenching. The temp. coeff. of the transformation velocity appears to be of the same order as that for a homogeneous chem. reaction. F. P. FLAGG

Brass with lead in it. A. W. JORDAN. *Brass World* 19, 167 (1923).—Incorporation of a small amt. of Pb in a brass melt is a delicate and exacting operation. Bad prepn. of the Cu may neutralize the benefit for certain classes of work that the Pb is to bring, and the Cu and Zn must be thoroughly incorporated before the Pb is added.

W. H. BOYNTON

Temper-carbon. L. NORTHCOTT. *J. Iron Steel Inst.* (advance proof) 4 pp. (May 1923).—Temper-C is not amorphous C, but possesses all ordinary properties of graphite and is merely that material in a state of fine subdivision.

V. O. HOMERBERG

Structural constitution of iron-carbon-silicon alloys. KOTARO HONDA and TAKEJOJI MURAKAMI. *J. Iron Steel Inst.* (advance proof) 39 pp. (May 1923).—By utilizing thermal and magnetic analyses and microscopic observation, the Fe-C-Si alloys contg. less than 30% Si and 4% C have been systematically investigated, and a structural and constitutional diagram has been obtained; the processes of crystn. and transformation of the ternary alloys as well as the change of structure under heat treatment have also been studied. In this system a non-magnetic double compd., or silico-carbide, probably consisting of cementite and Fe silicide, is found. This compd. is very unstable and easily decomposes to form graphite. Plain cementite is also found in this system, provided the Si content is less than 5.5%. If the Si further increases, it is not observable, irrespective of C content or rate of cooling. At room temp., this carbide does not form a solid soln. with the double compd. or silicide. The soly. of carbides (cementite or double compd.) in the melt decreases as Si increases, and in alloys contg. more than 20% Si it is about 0.3% at 1500°. During cooling from the melt, a silico-austenite or carbide, which easily decomposes to form graphite, primarily seps., and at a certain temp. these 2 form a eutectic, provided the content of Si and carbide exceeds a certain limit. The eutectic point gradually rises from 1130° to 1200°, and its content of C decreases from 4.3 to 0% as Si increases. By a further cooling the silico-austenite sets free the silico-

ferrite or carbide, which easily decomposes to form graphite, and at a certain temp. these 2 form a pearlite. The eutectoid point gradually rises, and its concn. of C decreases as Si increases; in alloys contg. more than 7% of Si, the change is not perceptible. If the Si content exceeds 16%, the compd. Fe_3Si_2 seps. from the austenite besides the carbide. The A_3 and A_1 points rise, their magnitudes decrease as Si increases; but the A_2 point falls, so that the latter change takes place at a lower temp. than the A_1 change, provided the Si content exceeds a certain limit. The graphite found in this system is not a primary product from the melt of the austenite, but a secondary product decomposed from the carbide set free, gases probably acting as a catalyzer. The readiness of the graphite formation in this system depends on the facts that (1) the silico-carbide primarily sepd. is very unstable; (2) Si diminishes the soly. of C in the melt or austenite, and (3) Si raises eutectic and eutectoid temps. As the cooling rate decreases, and the Si content increases, the degree of graphitization is greater. With a quick cooling, the solid soln. contg. silicide and carbide, the magnetic transformation of which is 550° to 450° , is seen. This constituent readily decomposes into graphite and silico-ferrite.

V. O. HOMERBERG

Constitution of the alloys of iron and nickel. D. HANSON AND J. R. FREEMAN. *J. Iron Steel Inst.* (advance proof) 14 pp. (May 1923); *Engineering* 115, 687-70.—The constitution of the alloys from 900° to their m. p. was detd. δ -Fe seps. from the liquid up to a concn. of approx. 7% Ni. A continuous series of solid solns. is obtained between approx. 7 and 100% Ni. The f.-p. curve over this range has a min. at a concn. of approx. 65 to 70% Ni. The Fe-rich alloys between 0 and about 7% Ni undergo a transformation below the liquidus, at which the δ -Fe first formed changes into γ -Fe. The δ - γ transformation temp. of pure Fe is raised by Ni. This effect is very profound; an addn. of 3% Ni raises the transformation point 100° . The complete equil. diagram of the Fe-Ni alloy and photomicrographs are given.

V. O. HOMERBERG

Titanium alloys and compounds. A. H. A. ROBINSON. *Chem. Trade J.* 72, 695-7 (1923).—A survey of present and possible future uses.

E. J. C.

The corrosion of non-ferrous metals. W. FRAENKEL. *Z. Metallkunde* 15, 91-7; *Z. angew. Chem.* 36, 245-7 (1923).—A discussion of the principles controlling the corrosion of non-ferrous metals.

F. P. FLAGG

Solders for aluminium. ANON. Bur. Standards, *Circ. No. 78*, 14 pp. (1923).—All metals or combinations of metals used for Al soldering are electrolytically electro-positive to Al. A soldered joint is therefore rapidly attacked when exposed to moisture and disintegrated. There is no solder for Al of which this is not true. Joints should never be made by soldering unless they are to be protected against corrosion by a paint or varnish, or unless they are heavy, such as repairs in castings, where corrosion and disintegration of the joint near the exposed surface would be of little consequence. Solders are best applied without a flux or by using paraffin as a flux, after preliminary cleaning and tinning of the surfaces to be soldered. The compn. of the solder may be varied within wide limits. It should consist of a Sn base with addn. of Zn or of both Zn and Al, the chief function of which is to produce a semifluid mixt. within the range of soldering temps. Suggested ranges of compn. are given. The higher the temp. at which the "tinning" is done, the better the adhesion of the tinned layer. A perfect union between solder and Al is very difficult to obtain. The joint between previously tinned surfaces can be made by ordinary methods and with ordinary soft solder. Only the "tinning" mixt. need be special for Al. The tensile strength of a good Al solder is about 7000 lbs./sq. in. Much dependence should not be placed on the strength of a joint. Macrographs and a bibliography are included.

V. O. HOMERBERG

Some effects of current in metallurgical operations (SAKLATWALLA) 4. Electrical conductivity and the constitution of alloys. System Pb-Tl (GUERTLER, SCHULZE) 2.

TRUSCOTT, S. J.: *A Textbook of Ore Dressing*. London: Macmillan and Co., Ltd. 680 pp. 40s.

WHITE, F. B. HOWARD.: *Nickel*. New York: Isaac Pitman & Sons. Pitman series of common commodities and industries. 118 pp. \$1. Payable in advance. Reviewed in *Metal Ind.* 21, 200 (1923). For sale by *Metal Ind.*

Flotation of minerals. W. O. BORCHERT. *Can.* 232, 145, June 19, 1923. To the pulp is added a small amt. of a colloid which of itself possesses the property of inhibiting the flotation of one mineral while permitting the flotation of another. The pulp remaining after flotation is treated to remove the dispersed colloid so as to promote flotation of another metal and then subjected to flotation. Cf. *C. A.* 17, 2259.

Filtration of minerals. W. O. BORCHERT. Can. 232,149, June 19, 1923. Flocculated colloidal matter in an ore pulp is dispersed and the dispersed colloidal matter is removed by decantation to reduce its filtration-inhibitory effects. The pulp is then filtered more readily.

Flotation agents and method of producing the same. R. E. SAYRE. Can. 231,290, May 22, 1923. A flotation agent consisting of a ketone condensation product and one or more thiourea compds., one of which is thiocarbanilide, is produced by adding an amine and CS_2 to a solvent contg. ketone condensation products and causing the combination of the amine and CS_2 to produce a thiourea compd. in the solvent. Cf. C. A. 16, 2297.

Concentration of minerals. W. O. BORCHERT. Can. 232,148, June 19, 1923. The flotation of minerals associated in a pulp with colloidal matter, is improved by a preferential froth flotation to remove the colloidal matter and then a further flotation operation.

Concentration of minerals. W. O. BORCHERT. Can. 232,151, June 19, 1923. Colloid-bearing milling water for use in the treatment of ores is subjected to a flotation treatment with a suitable frothing agent, thus removing the colloidal constituents.

Concentrating ores. S. H. DOLBEAR. U. S. 1,458,467, June 12. Ore pulp mixed with a small amt. of a selective reagent, such as oil, is circulated in contact with a metal surface to which the metallic particles of the ore, but not the gang, adhere. Galena or sphalerite ores may be treated in drums of Sn or Zn.

Froth-breaking devices. W. O. BORCHERT. Can. 232,146, June 19, 1923. A disk having a roughened surface is mounted for rotation about a horizontal axis in a flotation app.

Apparatus for sedimentation of ore slimes or other solids from suspension in liquid. N. C. CHRISTENSEN. U. S. 1,458,805, June 12.

Furnace for melting brass, lead or other metals. G. D. FAULDS. U. S. 1,458,283, June 12. The furnace comprises a relatively deep fusion hearth, a high front bridge wall between the hearth and combustion chamber, a curved top wall to direct hot gases over the bridge and downwardly upon the hearth and a sloping outlet extending downwardly from the rear side of the hearth. A filling opening is located above the hearth and sufficiently toward its rear that material introduced through it will pile up to restrict the flow of gases to the outlet and present a good surface of material to the hot gases passing over the bridge wall.

Air-blast control for blast furnaces. H. W. GRAHAM. U. S. 1,458,288, June 12.

Chrome steel. SRISHIN YOSHIDA and SEISHO YONEZU. Japan. 41,472, Jan. 24, 1922. The steel contains 20–30% Cr, 1–2.5% Si, 0.1–1.0% V, and not more than 0.2% C. Small pieces of ferrochrome, ferrosilicon, and ferrovanadium are gradually added to a melted Fe, thoroughly melted and poured into a mold. The materials should contain no C. The product is soft, ductile and resistant to acids, salts and air.

Stainless iron or steel. TAKEO MIYAGUCHI and the IBICAWA DENKI KABUSHIKI KAISHA. Japan. 41,348, Dec. 27, 1921. The iron contains:

Cr(%).	C(%).	Cu(%).
5	less than $5 \times 3/55$	2–5
6	less than $6 \times 3/55$	1.5–5
7	less than $7 \times 3/55$	1–5
8	less than $8 \times 3/55$	0.2–5

On heating in a muffle furnace at 800° for 2 hrs. in the current of O, only 0.00013–0.00015 g. O per cu. m. of metal was absorbed. The product does not crack readily on bending.

Temperable cast iron. MASAKICHI KUBO and KABUSHIKI KAISHA SHIRAURA SEISAKUJO. Japan. 41,431, Jan. 24, 1922. Alternating current of 50 cycles is passed through cast iron heated to about 1,000°, during 30–60 min., at a c. d. of 200 amp. per sq. in. The higher the frequency, the larger the effect.

The dry reduction of iron. P. FARUP. Can. 232,109, June 19, 1923. In the reduction of Fe ore in the form of briquets or powder in an atm. of CO the reduced mass is cooled in an atm. contg. relatively little CO.

"Rustless" iron alloy. W. BENNETT. U. S. 1,458,568, June 12. Molten Fe is partially refined and Cr ore is reduced and the metal thus obtained refined in an elec. furnace with reducing and refining reagents. The molten Fe and ferro-Cr are then transferred to a combination arc and resistance elec. furnace and subjected to a final mixing, refining and deoxidation, to obtain an alloy resistant to rust and adapted for use as a "stainless steel." Mo, Ni, Cu, W, Mn, V or Ti, may be added.

Metallic compositions or alloys. H. BOVING. Can. 231,942, June 12, 1923.

Metallic compns. or alloys comprising metallic elements having widely different volatilizing points are prepd. by gasifying the elements having the lower volatilizing point and exposing to these vapors the other elements in a form in which they have a large surface compared with their vol.

Alloying and refining metals. H. C. HALL. U. S. 1,458,290, June 12. Granules of Al-Zn-Mg alloy or other metal to be added are coated with oil and introduced into a molten bath of Al or other main metal to be treated.

Alloying zinc with iron or steel. B. F. DIMM. Can. 231,949, June 12, 1923. An Fe or steel body is coated with Zn by any galvanizing process and then heated to 400–600° F. until the Zn coating, except for a small residue of dross and a thin film of ZnCO_3 , is absorbed by, and alloyed with, the metal body from its surface inward.

Bath for zinc plating. YUTA EGUCHI and the TOKYO AEN TOKIN KABUSHIKI KAISHA. Japan. 41,467, Jan. 24, 1922. An Fe bath is lined with fire-proof brick or the like resistant to Zn. A cover made of the same material and having smaller area than the bath is provided. Gas burners are fitted under the cover and the bath is heated from the surface.

Amalgamation of gold and silver. MANKICHIRO KANAZAWA. Japan. 41,481, Jan. 25, 1922. Upon a silvered Cu plate, Hg is spread, and on this impure powder of Au or Ag. When the amalgamating power is decreased because the surface has become dirty, it can be restored by polishing the surface with a cloth covered with NaHCO_3 .

10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER AND CLARENCE J. WEST

Pressure oxidation and heating of humic substances from sucrose. F. FISCHER, H. SCHRADER AND W. TREIBS. *Ges. Abhandl. Kennt. Kohle* 5, 230–4 (1921).—The humic substances obtained by Conrad and Guthzeit's method were subjected to pressure oxidation for 8.75 hours at 200°. 2.2 equivs. of acids were obtained in a clear red-brown soln., 0.27 equiv. being volatile. The residue by extrn. with ether yielded a viscous oil, which was evapd. to dryness and subjected to pressure heating for 3 hrs. at 400°. The gases evolved contained CO_2 and possibly furan. The solid product was light colored and had a tarry smell, and on steam distn. yielded an oily substance, probably basic. The residue contained salts of volatile fatty acids and BzOH . By sublimation a mixt. of iso- and terephthalic acids was obtained. J. S. C. I.

Halochromism. II. Halochromism phenomena of the ethylene hydrocarbons and their importance for the theory of halochromic compounds. SIEGFRIED SKRAUP AND LEO FREUNDLICH. *Ann.* 431, 243–70 (1923); cf. *C. A.* 16, 3646.—A comparison of the basicity of $\text{Ph}_2\text{C}(\text{OH})\text{Et}$ and the corresponding unsatd. hydrocarbon $\text{Ph}_2\text{C}:\text{CHMe}$ and that of $\text{Ph}_2\text{C}(\text{OH})\text{Pr}$ and $\text{Ph}_2\text{C}:\text{CHEt}$ shows that practically identical values are obtained. This indicates that unsatd. hydrocarbons are capable of showing halochromism phenomena and therefore earlier work on mixed carbinols and on unsatd. carbinols must be considered in the light of this fact. In view of the fact that the phenomena observed with either the carbinols or unsatd. hydrocarbons in concd. H_2SO_4 are confused by the presence of the equil. mixt. (carbinol \rightleftharpoons hydrocarbon + H_2O), the color reactions of SnCl_4 and SnBr_4 have been studied. The dissociation const. and the color with SnCl_4 and SnBr_4 were detd. for 8 hydrocarbons: Stilbene, 23.8, ..., yellow, ..., phenylstilbene, 6.74, 23.8, orange-yellow, orange; diphenylpropene, 2.75, 12.8, yellow, orange-yellow; α, α -*p*-anisylphenylethylene, ..., 1.61, ..., yellow; dianisylpropene, ..., 0.553, ..., red; diphenylbutene, 0.280, ..., yellowish green, citron-yellow; asymdiphenylethylene, 0.193, ..., greenish yellow, ...; *p*-anisylphenylpropene, 0.0259, 0.114, orange, red-orange. This indicates that in the ethylene type, $\text{Ph}_2\text{C}:\text{CHR}$, the dissociation const. decreases in the order, $\text{R} = \text{Ph}, \text{Me}, \text{Et}, \text{H}$. A study of the combinations which produce halochromism shows: (1) Acids and metallic halides give noticeable color reactions with quinones, unsatd. ketones, unsatd. NO_2 compds. and unsatd. hydrocarbons. (2) They give very weak or no color with satd. ketones. (3) They give no color reactions with satd. NO_2 compds. Many examples of these are given. *p*-Anisylmethylethylene, *p*-Anisylphenylpropene, m. 52°. *Di- α -p-anisylpropene* (I), m. 101° from EtMgBr and (*p*- MeOC_6H_4) $_2\text{CO}$; the compd. prepd. by Gatterman's method (*Ber.* 22, 1130) is yellow and m. 102°. A mixed m. p. gave a depression of 20°. H_2SO_4 decolorizes G.'s compd., while with I intensive halochromism is produced. It is evident that G.'s compd. is not I. C. J. WEST

Action of potassium acetate upon aliphatic bromides as a method for the deter-

mination of constitution. I. B. K. MERESHKOWSKY. *Ann.* **431**, 231-43(1923).—The following general statements may be made: *Monobromides*.—Br is split off from primary and sec. C atoms with the formation of Ac esters, from tert. C atoms with the formation of unsatd. hydrocarbons, the H being removed from the C holding the smallest no. of H atoms. *Dibromides*.—Diprimary bromides give only the esters of the corresponding glycols. Primary-sec. bromides give: about 25% unsatd. monobromide (a) and glycol diacetate (b); disec. bromides give about 50% a and 25% b. Primary-tert. bromides give only unsatd. monobromide, with the Br on the primary C atom, while in the sec.-tert. bromides the Br remains on the sec. C atom. Di-tert. bromides give doubly unsatd. hydrocarbons. *Tribromides*.—Diprimary-sec. bromides split off Br from a primary C atom, giving an unsatd. Br ester. Diprimary-tert. bromides behave similarly but the 3rd Br remains attached to the primary C atom. Disec.-tert. bromides give unsatd. 1,2-Br₂ compds. Compds. with 2 Br on primary C and 1 Br on tert. C atoms give unsatd. dibromides, CBr₂:C:. If the 3rd Br atom is on the sec. C atom, a mixt. of CHBr:CBBr- and CBr₂:CH- results. Tetrabromides react in the same way as the di- and tribromides. CH₃:CBrCH₂OAc. (*Ber.* **5**, 453) b₁₀₀ 103.5, b₁₁₈ 163°, d₄²⁰ 1.48908, d₄²⁰ 1.45682, n_D²⁰: α 1.465046; D, 1.466694; β, 1.474382; γ 1.481248. Me-CHBrCHBr₂ b₁₀₀ 89.2, d₄²⁰ 2.39384, d₄²⁰ 2.35484; n_D²⁰: α 1.57016; D, 1.573983; β, 1.58470; γ, 1.593719. The action of KOAc gives MeCBr:CHBr (*Ann.* **136**, 57), b₁₀₀ 129-30°, d₄²⁰ 2.04558, d₄²⁰ 2.00768; n_D²⁰: α, 1.52618; D, 1.529992; β, 1.53987; γ, 1.549323. Me-CBr₂CH₂Br, b₁₀₀ 80.6°, d₄²⁰ 2.33690, d₄²⁰ 2.29854; n_D²⁰: α, 1.56247; D, 1.566963; β, 1.577794; γ, 1.585556. AcOK gives MeCBr:CHBr. MeC(CH₃OAc):CBr₂ (C. A. **17**, 2266) d₄²⁰ 1.77845, d₄²⁰ 1.75001; n_D²⁰: α, 1.513898; D, 1.517607; β, 1.527015; γ, 1.53509; the alc., MeC(CH₃OH):CBr₂, m. 31°, d₄²⁰ 2.02099, d₄²⁰ 1.99193; n_D²⁰: α, 1.556243; D, 1.560942; β, 1.571956; γ, 1.580662. C. J. WEST

Chemical breakdown of lignin by pressure oxidation. F. FISCHER, H. SCHRADER AND W. TREIBS. *Ges. Abhandl. Kennt. Kohle* **5**, 221-9(1921).—Lignin obtained by treating wood with concd. HCl contained C 60.6, H 4.5, H₂O 12.6, ash 3.3%. In 2.5 N soda soln. shaken with air thrice for 2-3 hrs. at 200°, it gave an almost opaque brown soln. with characteristic odor, leaving 44% undissolved. In addn. 0.101 equiv. of acid products was obtained, besides CO₂ and MeOH. Pressure oxidation for 40 hrs. under the same conditions gave 0.55 equiv. of acid products, which included mellic acid, C₆H(CO₂H)₃, and oxalic acid. J. S. C. I.

Action of sulfur monochloride on mercaptans. G. C. CHAKRAVARTI. *J. Chem. Soc.* **123**, 964-8(1923).—When S₂Cl₂ reacts with real mercaptans there is no sepn. of S, compds. of the type (RS)₂S:S being formed. With potential mercaptans S is partly eliminated and in some cases the mol. is completely ruptured. Thus S₂Cl₂, like ClC(NO₂)₃, can be utilized in differentiating real and potential mercaptans. EtSNa in abs. EtOH and S₂Cl₂ in petrol. ether give the product (EtS)₂S:S, golden yellow, mobile oil, b. 210-2°. PhSK and S₂Cl₂ give the compound (PhS)₂S:S, yellow oil with offensive odor. HSCH₂-CH₂S and S₂Cl₂ give the compound (HSCH₂CH₂S)₂S:S, m. 126-8°. *Compd.* (PhCH₂S)₂S:S, m. 48-50°. *Compd.* C₁₀H₁₀N₄S₄, from 5-thiol-2-thio-3-phenyl-2,3-dihydro-1,3,4-thiadiazole, m. 131-2°. With MeI this gives a product, C₁₀H₁₀S₄N₄·7MeI, m. 124°, and with EtI, the product C₁₀H₁₀N₄S₄·7EtI, m. 114-6°. 2,5-Dithiol-1,3,4-thiadiazole gave the *compd.* C₂N₂S₆, decomp. 80°. Heated with excess EtI for 5 hrs., the *compd.* C₂N₂S₃·3EtI, m. 114°, is obtained. *Compd.* (β-C₁₀H₇S)₂S:S, m. 82-5°. BzSH and S₂Cl₂ give Bz₂S₂. CS(NHPh)₂ gave a product rich in S (not cryst.) and a *compd.* C₁₀H₁₀N₄Cl, m. 248°. PhN:CMesK was completely decompd., 1 of the products being PhNH₂·HCl. PhCSNH₂ gave a ppt. of S and the *compd.* C₁₀H₁₀N₄S, m. 92°. Pinacolylthiocarbamide and allylphenylthiocarbamide were decompd. and no pure *compd.* could be isolated. MeCSNH₂ gave the *compd.* C₇H₁₀N₄S, m. 104°. C. J. WEST

α,α'-Dichlorodialkyl sulfides. F. G. MANN AND W. J. POPE. *J. Chem. Soc.* **123**, 1172-3(1923).—(CH₃Cl)₂S is formed in about 70% yield from S₂Cl₂ and (CH₃)₂ (cf. Bloch and Höhn, C. A. **16**, 2109), but the yield is quant. if SCl₂ is used; it b₁₈ 57.5-8.5°, has d₄¹⁴ 1.4144, forms a hard, cryst. mass when cooled in solid CO₂ and EtO; it has no vesicant action. The *sulfoxide*, m. 40°, is prepd. by slowly adding the sulfide to an agitated mixt. of 2 vols. fuming and 1 vol. concd. HNO₃ in ice and salt. α,α'-Dichlorodimethylsulfine-p-toluenesulfonylamine, m. 102°, results from the sulfide and chloramine-T. Ethyl tetrahydrothiophene-3,3,4,4-tetracarboxylate, b₁₈ 220-3°, from the sulfide and [CH(CO₂Et)₂]₂; it is not hydrolyzed by boiling 9 hrs. with 18% H₂SO₄ or 7 hrs. with 7% aq. alc. KOH but appears to be by prolonged boiling with 10% aq. KOH. α,α'-

Dichlorodithiethyl sulfide, b_{11} 56–7°, b_{17} 66.5–7.5°, b_{11} 76–7, d_4^{15} 1.1992. It has an unpleasant musty odor and no vesicant action. α, α' -*Diethoxydithiethyl sulfide*, b_{11} 87–7.5°. *Diethyldiene trisulfide*, b_{11} 89–90°, pale green liquid. Cold concd. HNO_3 oxidizes it with liberation of S, which indicates the formula $\text{S}:(\text{CHMe})_2\text{S}:\text{S}$. S_2Cl_2 converts thialdine into a black mass; if the reaction is moderated by using a CCl_4 soln., HCl is evolved and a reddish black solid formed, but only CCl_4 distd. under diminished pressure. β -Trithiobenzaldehyde dissolves in S_2Cl_2 without evolution of HCl; no definite compd. was isolated. With SCl_2 a little HCl is evolved and some PhCHCl_2 distills at 21 mm.

C. J. WEST

Ethyl ether and ethanol-mercury salts. Reply to W. Manchot. K. A. HOFMANN AND KURT LESCHIEWSKI. *Ber.* 56B, 123–9(1923); cf. *C. A.* 14, 2926.—Polenical.

C. J. WEST

Electrolytic method for the preparation of mercury dimethyl. J. L. MAYNARD AND H. C. HOWARD, JR. *J. Chem. Soc.* 123, 960–4(1923).—The equiv. cond. of 0.1 *N* aq. solns. at 25° was detd. as follows: MeHgOH , 0.71; MeHgOAc , 4.92; $(\text{MeHg})_2\text{SO}_4$, 57.40; MeHgNO_3 , 101. The change of the cond. of MeHgNO_3 upon diln. was found to be: 10.1, 101; 50, 116; 250, 129; 1250, 150; 6520, 162. The ionization const. of the hydroxide, calcd. from the degree of hydrolysis of the nitrate, was 3.9×10^{-11} . The sp. cond. of 0.05 *N* MeHgOAc at 25° is 33.7×10^{-6} ; addn. of 0.1 mol. $\text{C}_3\text{H}_5\text{N}$ per mol. of MeHgOAc gave a value of 147×10^{-6} ; 1 mol., 232; 2 mols., 271; 4 mols., 277. MeHgI is readily formed when MeI and Hg_2I_2 are exposed at 75° to the light of the elec. arc. The Ac deriv. may be obtained from hot aq. suspensions of MeHgI by addn. of $\text{Hg}(\text{OAc})_2$. In the prepn. of HgMe_2 the electrolyte consisted of 25% aq. MeHgOAc contg. 2 mols. $\text{C}_3\text{H}_5\text{N}$ per mol. MeHgOAc maintained at 30–40°. An av. current of 1.67 amp. flowed for 2 hrs. 10 min. (total amp.-hrs., 10.64); yield HgMe_2 , 92%.

C. J. WEST

The action of acetylene on zinc ethyl. J. F. DURAND. *Compt. rend.* 176, 992–3(1923).—*Zn acetylde* was prepd. by passing pure, dry C_2H_2 through ligroin contg. ZnEt_2 . ZnC_2 is white, reacts with H_2O giving C_2H_2 , deteriorates in moist air and gives ZnO on heating. Under similar conditions C_2H_2 passed through HgPh_2 in C_6H_6 gave no reaction. D. expects to continue the work on similar reactions.

R. CHESTER ROBERTS

Isomeric trithioacetaldehydes. F. G. MANN AND W. J. POPE. *J. Chem. Soc.* 123, 1178–81(1923).— γ -Trithioacetaldehyde (cf. Marckwald, *Ber.* 19, 1826), m. 81°, sublimes 100° (M. gives m. 76°), has been prepd. by the action of Ag_2S , H_2S , Ag_2O or NaOH upon $(\text{MeCHCl})_2\text{S}$. A soln. in MeI gradually deposits the β -form, m. 126°, also obtained by heating diethylene trisulfide with MeI .

C. J. WEST

Mechanism of oxidation processes. V. Oxidation of aldehydes. HEINRICH WIELAND AND AUGUST WINGLER. *Ann.* 431, 301–22(1923); cf. *C. A.* 16, 1245.—In the detn. of HCHO , H_2O_2 is used with a known excess of NaOH , the products of reaction being HCO_2Na , H_2 and H_2O . Since it is unlikely that this consists of a simple direct reaction of the components and since this reaction has been used in the discussion of the mechanism of the oxidation process, it was desirable to study it further. While the reaction occurs in dil. aq. soln., the reaction product was best isolated from an Et_2O soln. of the 2 components in 80–90% yield and proved to be identical with the impure hexahydroxymethylenc triperoxide of Legler (*Ann.* 217, 381). It is now termed *dihydroxymethyl peroxide* (*dimethylol peroxide*), $[\text{H}_2(\text{HO})\text{CO}]_2$, m. 62–4°. In the dry state it is fairly stable, but in soln. at moderate temp. it liberates H . The cold aq. soln. is stable towards KMnO_4 . In alk. soln. the decompn. into H and HCO_2H is practically quant. If heated without a solvent, in C_6H_6 , H_2O or acid, the amt. of H formed varies between 66 and 85% of the theory, HCHO also being formed. This may be due to the formation as an intermediate step of $\text{HOH}_2\text{C.O.OH}$. The H liberated in this reaction is mol. or inactive. The peroxide reacts vigorously with H_2SO_4 , giving H_2SO_4 with $\text{C}_6\text{H}_4(\text{OH})_2$, giving $\text{O}:\text{C}_6\text{H}_4:\text{O}$ and liberates I , HCHO being formed in these cases. The heat of formation of the peroxide is calcd. to be 75 cal. *Dihydroxyethyl peroxide*, H_2O -sol. oil, was only obtained impure from the components in Et_2O . Upon warming the aq. soln., no H is evolved, the products being ACh , H_2O_2 , AcOH and H_2O . It is believed that this peroxide is the peroxide-like product formed upon long standing of Et_2O . The mechanism of the direct oxidation of aldehydes is discussed.

C. J. WEST

Synthesis of α, γ -dihydroxycaproic aldehyde and its methyl hemiacetals. BURCKHARDT HELFERICH AND ARNO RUSSE. *Ber.* 56B, 759–66(1923).— α, γ -*Diketocaproic aldehyde di-Et acetal* (I), obtained in 33% yield from $(\text{EtO})_2\text{CHCO}_2\text{Et}$ rubbed in a cold mortar with 1 mol. dry NaOEt and, after standing 15 min. in a CaCl_2 desiccator, with

1 mol. MeCOEt, b_1 110–6°, $n_D^{18.5}$ 1.4505, d_4^{18} 1.0102, has a burning ethereal odor, dissolves easily in alkalis and NH_4OH , gives an intense red-violet color with $FeCl_3$ in alc., does not reduce boiling Fehling soln., is hydrolyzed by hot mineral acids, the soln. then reducing Fehling soln. strongly; on standing it becomes yellow to orange-red; heated on a Cu wire in the Bunsen flame as in the Beilstein halogen test, it imparts an intense green color to the flame, owing to the formation of a volatile Cu salt, $C_{20}H_{34}O_8Cu$, which is obtained in 50% yield as a dark blue oil solidifying to light blue crystals, m. 115°, from I with 0.5 mol. $Cu(OAc)_2$ in H_2O . I, reduced as described below for the di-Me compd., takes up only 2 atoms of H, even with a large excess of amalgam, yielding γ -hydroxy- γ -ketocaproic aldehyde di-Et acetal (1.8 g. from 10 g. I), $b_{1.5}$ 110–20°, $n_D^{18.4}$ 1.4401, $d_4^{18.6}$ 1.0040, viscous, faintly yellow liquid of resinous odor and oily taste, salted out from aq. soln. by alkalis, gives no color with $FeCl_3$, reduces Fehling soln. only after hydrolysis with mineral acids. Me dimethoxyacetate, obtained in 82% yield from Cl_2CHCO_2K slowly added to 2.5 atoms Na in boiling MeOH, refluxed 12 hrs., freed from the MeOH on the H_2O bath, boiled 15 min. in H_2O , neutralized with CO_2 , evapd. under 16–30 mm. at 20–70° and extd. with hot abs. MeOH, the MeOH soln. then being treated with a 0.5 mol. excess of HCl and allowed to stand overnight, b_{12} 61–4°, does not reduce boiling Fehling soln., is somewhat hygroscopic but otherwise stable. Treated with NaOMe and MeCOEt as in the prepn. of I it gives 42% of α , γ -diketocaproic aldehyde di-Me acetal (II), b_1 100–6°, n_D^{18} 1.4574, d_4^{17} 1.0660; Cu salt, dark blue-green tablets with 1 H_2O , m. 72°, or anhyd. dark green tablets, m. 78°, is colored dark brown by concd. H_2SO_4 , dark yellow by concd. HCl. From 20 g. II in 115 cc. cold N NaOH treated with 36 g. NH_4Cl and, in the course of 1.75 hrs., with 500 g. of 2.5% Na-Hg is obtained 4.7 g. of the α , γ -di-HO acetal (III), b_3 112–20°, n_D^{18} 1.4460, d_4^{24} 1.0407, viscous faintly yellow liquid of pleasant resinous odor, at once salted out from H_2O by alkalis, easily sol. in NH_4OH , gives no color with $FeCl_3$, faintly reduces Fehling soln. on long boiling, is hydrolyzed to the aldehyde by 2 N H_2SO_4 in 10 min. at 100° or by 0.1 N acid at room temp. on long standing, is somewhat hygroscopic and gradually becomes yellow at room temp. Di-HO aldehyde, $b_{0.8}$ 95–107.5°, $n_D^{18.6}$ 1.4564, $d_4^{20.5}$ 1.0927, faintly yellow liquid of resinous caramel-like odor and taste, reduces cold Fehling soln., quickly and Tollens Ag soln. immediately, reddens fuchsin- SO_2 in about 1 min., is somewhat hygroscopic, soon becomes yellow on standing. Slowly treated in ice-salt with 15 parts of 1% HCl in MeOH and allowed to stand 2 days at room temp., 2.75 g. III gives 0.9 g. of a hemiacetal, b_{12} 103–9.5°, $n_D^{20.7}$ 1.4375, $d_4^{22.5}$ 1.0510, liquid of peppermint oil-like odor and pleasant bitter taste, easily sol. in H_2O , not salted out by alkalis, does not reduce boiling Fehling soln., hydrolyzed to the aldehyde by 0.1 N H_2SO_4 in 5 min. at 100°, is somewhat hygroscopic. With 4 parts of 0.25% HCl in MeOH 2.85 g. of III gives after 50 hrs. in sealed tubes at 100° 1 g. of an isomeric hemiacetal, $b_{12.5}$ 102–15°, liquid of peppermint-like odor and bitter taste, moderately sol. in H_2O , salted out by alkalis, faintly reduces boiling Fehling soln., begins to be hydrolyzed by 0.01 N H_2SO_4 at room temp. only after 3 hrs. while under the same conditions 0.01 g. of its isomer reduces 0.05 cc. Fehling soln. after 1 hr. Possibly the 2 isomers have the structures $MeCH_2CH.CH_2CH(OH).CH(OMe).O$ and $MeCH_2CH(OH).CH_2CH.CH(OMe).O$, corresponding to γ -Me glucoside on the one hand and α -

$CH_2CH.CH(OMe).O$, corresponding to γ -Me glucoside on the one hand and α -

and β -Me glucosides on the other, or, since 2 asym. C atoms are present, they may be 2 di-isomers. C. A. R.

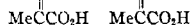
The preparation of mesityl oxide. RENÉ LOCQUIN. *Ann. chim.* 19, 32–44 (1923).—Mesityl oxide, $Me_3C:CHCOMe$, (I) is most economically prepd. by the dehydration of Heintz' aldol, $Me_3C(OH)CH_2COMe$ with $(CO_2H)_2$. Equal vols. Me_3CO and NaOH ($d. = 1.32$) are shaken 30 hrs. at 8°, the ketonic layer is decanted, and neutralized with $(CO_2H)_2$. The residue, after removal of Me_3CO , is distd. with 4% of dried $(CO_2H)_2$; I b. 125–35°. I. P. ROLF.

The preparation of the homologs of mesityl oxide by the action of gaseous hydrochloric acid on the ketones. C. V. GHEORGHIU. *Bull. sect. sci. acad. Roumaine* 8, 68–71 (1923).—The condensation of Me_3CO with MeCOEt in the presence of dry HCl gives (1) mesityl oxide; (2) methylmesityl oxide; (3) methyl-3-hexen-5-one; (4) 3-dimethyl-3-hexen-5-one. MeCOEt treated in the same manner gave 3,4-dimethyl-3-hexen-5-one. Yields are low in each case because of condensation and polymerization products. R. CHESTER ROBERTS

Alkylglycerols. I. Preparation of the vinylalkylcarbinols. RAYMOND DELABY. *Bull. soc. chim.* 33, 602-26 (1923).—See C. A. 17, 723. E. J. C.

Arachidic acid, isobehenic acid and normal eicosanic acid. R. EHRENSTEIN AND H. STUEWER. *J. prakt. Chem.* 105, 199-207 (1923).—The "arachidic acid" obtained from peanut oil m. 75°, the Me ester b₁₀ 228-9°, m. 54°, and these are identical with the isobehenic acid obtained from lignoceric acid. It has the formula C₂₂H₄₂CO₂H and is not normal eicosanic acid but isodocosanic acid. The name isobehenic acid should be stricken from the literature and replaced by arachidic acid. Arachidic and lignoceric acids have the same branched-chain residue C₂₁H₄₀. Normal eicosanic acid is found in nature in the oil of *Nephelium lappaceum* J. as a glyceride, and is identical with that obtained by a KOH melt of erucic acid, m. 76-7°. C. J. WEST

Configuration of the crotonic acids. K. V. AUWERS AND H. WISSEBACH. *Ber.* 56B, 715-31 (1923).—In order to throw light on the still unsolved problem of the configuration of the crotonic acids by means of chem. reactions which do not directly involve the unsatd. C atoms and in which, therefore, the danger of rearrangements and abnormal processes is probably less, the easily accessible CCl₃CH:CHCO₂H (I) was treated with concd. H₂SO₄ and found to yield fumaric acid (II) smoothly; in no case could maleic acid (III) be detected. Expt. showed that III under similar conditions is practically unchanged by H₂SO₄, nor could the II have been formed from III under the influence of the HCl liberated from I, for a soln. of Na maleate, NaCl and H₂SO₄ remained clear for weeks, while a soln. of I of the same concn. deposited II in a few days. Again, in a mixt. of Na maleate and 1-methyl-1-dichloromethyl-4-ketodihydrobenzene in concd. H₂SO₄, in which, as in the transformation of I into II, HCl was slowly liberated, the III remained practically unchanged. In none of the expts. with I was it possible to detect chlorosuccinic acid, which should be produced in considerable amts. if III were an intermediate product in the conversion of I into II. v. A. and W. conclude that I has the *trans*-configuration. Again, I and its esters are reduced by Zn dust and AcOH to Cl₂CHCH:CHCO₂H (IV) and this with Na-Hg yields almost quant. solid crotonic acid (V) and none of the iso-acid (VI). V is therefore believed to be the *trans*-, VI the *cis*-. Making the assumption (the correctness of which can hardly be doubted) that when there is *cis*-addn. of a halogen to an C₂H₂ or C₂H₄ deriv. subsequent elimination of halogen acid also occurs in the *cis*-position, each of the crotonic acids on addn. of halogen and subsequent loss of the β-halogen atom as halogen acid must yield an α-halogen deriv. of its stereoisomer, as has been shown experimentally by Wislicenus. This therefore detts. the configuration of the α-halocrotonic acids. Of the two MeCCl:CHCO₂H one with Na-Hg yields V exclusively, the other a mixt. of V and VI with a little MeC:CCO₂H; in these reductions under mild conditions the labile VI may doubtless rearrange into its stable isomer, while this is not the case with V; so that the MeCCl:CHCO₂H giving VI among its reduction products is undoubtedly the *cis*-acid. The analogy between the behavior of tiglic (VII) and angelic (VIII) acids on the one hand and V and VI on the other makes it probable that the 2 former have the configurations MeCH and HCMe, resp. The m. ps. and dissociation consts. of V and



VI and their α- and β-Cl derivs. and of VII and VIII and the h. ps., d. and n of their esters agree in general with the configurations assigned above to these acids. C. A. R.

γ,γ,γ-Trichlorocrotonic acid, γ,γ-dichlorocrotonic acid and maleinaldehydic acid. K. V. AUWERS AND H. WISSEBACH. *Ber.* 56B, 731-41 (1923); cf. preceding abstr.—CCl₃CH(OH)CH₂CO₂H (I) is obtained almost quant. from 1 mol. each of CCl₃CHO, H₂O and CH₂(CO₂H)₂ and 1.5 mols. C₂H₅N gently warmed 3-4 hrs. on the H₂O bath. This was converted in the usual way into CCl₃CH:CHCO₂H (II) (the substance described under this name in the new edition of Beilstein (II, 418) is really I) which, treated in ice with 4 parts SOCl₂ and then gently boiled 2 hrs., yielded 75% of the *chloride* of II, b₁₁ 75°, d₄¹⁸ 1.5292, d₄²⁰ 1.528, n 1.51414, 1.51812, 1.52890, 1.53823 for α, D, β and γ at 18.8°, M 0.54, 0.56, 25%, 27% for α, D, β-α and γ-α, resp. *Amide* (2.8 g. from 3.5 g. of the chloride in Et₂O satd. with NH₃), m. 83°. *Nitrile*, from the amide and P₂O₅ heated 1 hr. *in vacuo* at 50-60°, b₁₀ 74-5°, b₂₈ 91°, d₄¹⁴ 1.4319, d₄²⁰ 1.420, n 1.50837, 1.51225, 1.52242, 1.53138 at 11.2°, M 0.66, 0.67, 24%, 28%. *Amide*, m. 162.5-3.5°. **γ,γ-Dichlorocrotonic acid (III)**, from II in alc. and aq. AcOH at 50-60° with Zn dust (preceding abstr.), m. 42-3°, b₁₈ 130°, b₁₂ 123°, d₄²⁰ 1.3331, d₄^{29.1} 1.3327, n 1.45680, 1.45986, 1.46777, 1.47565 at 99.4°, M 0.23, 0.22, 8%, 15%. Unlike II, III splits off only traces of HCl on long contact with H₂O; on warming, the NaOH soln. becomes yellow, then brown and finally deep red-brown; a neutral soln. gives with AgNO₃ the

white Ag salt which, heated with H_2O , deposits AgCl and Ag in mirror form and the soln. reddens fuchsin- SO_2 ; in cold concd. H_2SO_4 III at once begins to evolve HCl and after a few min. the dild. soln. reddens fuchsin- SO_2 ; this aldehyde reaction reaches a max. in about 10 min. but disappears in another 10 min. and the soln. now, when dropped upon ice, gives 88% $(CH_3CO_2H)_2$ (IV). α, β -Dibromo- γ, γ -dichlorobutyric acid, (V), from III and Br in $CHCl_3$ in sunlight, m. $120-1^\circ$. *Et ester* of III, from the *Et ester* of II in aq. alc. and AcOH with Zn dust at $50-60^\circ$ (yield, 90%), $b_D^{20} 82^\circ$, $d_4^{20} 1.2323$, $d_4^{20} 1.229$, $n 1.46096$, 1.46347 , 1.47098 , 1.47711 at 16.6° , M 0.08, 0.05, 1%, 2%; on standing, the d. rapidly increases and after a few hrs. the b. p. is no longer at all sharp; with Br in CS_2 it instantly gives the *Et ester* of V, $b_D^{20} 158-9^\circ$, $d_4^{20} 1.8257$, $d_4^{20} 1.830$, $n 1.51936$, 1.52233 , 1.53096 , 1.53787 at 22.6° , M 0.22, 0.21, 4%, 3%. *Me ester* of III, obtained in 90% yield by reduction of the *Me ester* of II, $b_D^{20} 77^\circ$, $d_4^{20} 1.3050$, $d_4^{20} 1.302$, $n 1.46744$, 1.47040 , 1.47811 , 1.48442 at 17.7° , M -0.02 , -0.04 , 3%, 2% (as the ester shows slight depressions instead of the expected exaltations, the optical consts. above are doubtful). *Me ester* of V, $b_D^{20} 145^\circ$, m. 37° . *Chloride* of III, $b_D^{20} 66-7^\circ$, $d_4^{20} 1.4429$, $d_4^{20} 1.442$, $n 1.49547$, 1.49928 , 1.50818 , 1.51674 at 19.6° , M 0.05, 0.06, 7%, 12%. *Amide*, m. $82-3^\circ$. *Amide* of V, shrivels $156-7^\circ$; decomp. 162° . *Anilide* of III, m. 83° . *Nitrile*, $b_D^{20} 82-3^\circ$, $b_D^{20} 93.5-3.8^\circ$, $d_4^{20} 1.3049$, $n 1.49896$, 1.49735 , 1.50714 , 1.51500 , M 0.57, 0.59, 21%, 22%. Maleinaldehydic acid or α -keto- α' -hydroxy- α, α' -dihydrofuran (γ -hydroxy- Δ^1 -crotonolactone), prep. by Fecht's method (*Ber.* 38, 1272(1905)), m. 55° , $d_4^{20} 1.2621$, $n 1.45349$, 1.45632 , 1.46464 , ..., M 0.38, 0.38, 13%, ..., the optical data indicate that in the liquid melt the substance exists chiefly, if not exclusively, in the cyclic form. In cold H_2SO_4 it quickly loses the property of reddening fuchsin- SO_2 and on the next day the soln. is almost black and gives no definite product when poured upon ice and extd. with Et_2O . Aq. solns. probably contain an equil. mixt. of the 2 forms; with $p-O_2NC_6H_4NHNH_2 \cdot HCl$ it gives the lemon-yellow *p*-nitrophenylhydrazone, m. 221° , sepg. from alc. in brick-red prisms and needles with 1 $EtOH$, m. $211-2^\circ$.

C. A. R.

Molecular refractions of chloro-, dichloro-, and chlorobromoacetates. P. I. VANDERSTICHELE. *J. Chem. Soc.* 123, 1225-9(1923).—The d., n and mol. refraction for a no. of haloacetates are given. $ClBrCHCO_2H$ is reported as m. 25° . The mol. refractions obtained for $ClCH_2COCl$, $Cl_2CHCOCl$ and $ClBrCHCOCl$ confirm the high value attributed by Le Blanc and Eisenlohr to the refractivity of the Cl atom when combined with a CO group. If we consider the increase in the mol. refraction corresponding to the introduction of 1 atom of Cl in the Ac group (mean value $\Delta 4.645$) we find that the (Cl)-(H) differences diverge from the mean value by not more than 4.7%. Considering the effect of the introduction of a 2nd atom of halogen in the $ClCH_2CO$ group on the mol. refraction of the compd., we find that the (Cl)-(H) differences diverge from the mean value (5.137) by not more than 3% and the (Br)-(H) differences (mean value, 8.210) by not more than 3.1%. The mean increase in refraction caused by the 1st atom of Cl is distinctly smaller and the mean increase in refraction caused by the 2nd atom of halogen is distinctly larger than the values deduced from the Bruhl-Conrady and Eisenlohr averages. As far as this group of substances is concerned, the introduction of a 2nd atom of halogen in the $ClCH_2$ group causes a measurable exaltation of the mol. refraction.

C. J. W.

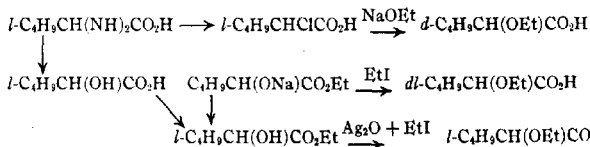
Imino-aryl ethers. II. The thermal decomposition of *N*-arylarly-iminoaryl ether hydrochlorides. A. W. CHAPMAN. *J. Chem. Soc.* 123, 1150-5(1923); cf. C. A. 16, 3478.—In order to confirm the method of decompn. of the imino-ether-HCl suggested in the 1st article, other members of the same series have been investigated. The main 1st products of the thermal decompn. are the corresponding phenols and anilideiminochlorides. *N*-Phenylbenziminophenyl ether hydrochloride, (I) pale yellow, m. $130-2^\circ$, is obtained in 75-80% yield by passing dry HCl into the ether in C_6H_6 . Heated in a stream of CO_2 at $160-170^\circ$, the products of decompn. were found to be the free imino-ether, $PhNHCPH \cdot NPh \cdot HCl$ (average yield, 18%), $PhOH$ and small amts. of $BzOPh$ and $BzNHPh$. The same products were obtained by heating $PhOH$ and benzanilide-iminochloride in a stream of CO_2 at 160° . *N*-*p*-Tolylbenziminophenyl ether hydrochloride, pale yellow, m. $132-4^\circ$; upon heating as above, the free imino-ether, di-*p*-tolylbenzyl-anilide-HCl and benzo-*p*-toluidide were obtained. Dista. of I in a stream of HCl gave the same products as were obtained by heating in a stream of CO_2 . C. J. WEST.

Preparation of hydrazine by Raschig's method. R. A. JOYNER. *J. Chem. Soc.* 123, 1114-21(1923).—Expts. have been made to ascertain the effect on the yield of N_2H_4 of varying the concn. of NH_4OH , $NaOCl$ and glue and of replacing the last by other

substances. The relation between the concn. of NH_3 and the yield of N_2H_4 (a) is expressed by a logarithmic curve and the expression $(\log b - 0.200)/a$ is const. for values of b between 2.8 and 77 (mol. ratio of NH_3 to NaOCl). The yield of N_2H_4 is almost directly proportional to the concn. of the gelatin at low concns. but the relative activity of the latter rapidly diminishes with increasing concn. The reaction is very sensitive to small amts. of gelatin and it is probable that 1×10^{-4} g. gelatin or similar substance could be detected in a vol. of 10 cc. In order to test whether the glue formed an additive compd. with NH_2Cl , partition expts. were carried out on NH_2Cl between Et_2O and various aq. solns. The results show that, if anything, the NH_2Cl tended to pass into the Et_2O phase in the presence of glue. The presence of the NH_4 ion lowers the yield of N_2H_4 to a great extent. When N_2H_4 was added to the reaction before the NaOCl the yield was less than that obtained when the 2 substances were added in the reverse order. The N_2H_4 causes a decreased yield in either case, but this decrease is not proportional to the amt. of N_2H_4 added. Urea, saccharin, NaN_3 , Na oleate, Na palmitate and LiCl had no catalytic effect. Gelatin, glue and peptone produced the same effect at all the concns. employed. Starch, dextrin and sucrose catalyzed the reaction only when used in amts. 100-300 times that of the gelatin. Peptized silicic and stannic acids had strong catalyzing effects. Large quantities of animal or wood charcoal, asbestos powder and powdered meerschaum acted catalytically, but kieselguhr, Ca phosphate, silica gel, French chalk and kaolin had no action. The probable explanation of the catalytic action is the strong adsorption of the NH_3 by the particles of glue.

C. J. WEST

Rotatory power of alkylleucic acids and allied compounds. SHINTARO KODAMA. *J. Chem. Soc. Japan* 43, 704-34 (1922).—Various derivs. of leucic acid were synthesized, and the effect of substitution on the rotatory power was detd. (1) *Ethylleucic acid esters*. d and $[\text{M}]_D^{20}$ of these derivs. are, resp., as follows: $\text{C}_6\text{H}_5\text{CH}(\text{OEt})\text{CO}_2\text{Me}$ 0.9447, +50.8°; Et ester 0.9156, +56.36°; Pr 0.9100, +57.54°; Bu 0.8948, +63.24°. In these esters, the d -rotation increases and the sp. gr. decreases as the wt. of an ester group increase. (2) *Alkylleucic acids*. When the alkyl group in these acids is changed, the changes in rotatory power show no definite relationship with the mol. wt. of the alkyl group. Thus, $[\text{M}]_D^{25}$ and $[\text{M}]_D^{25}$ of 5% solns. in C_6H_6 are: $\text{C}_6\text{H}_5\text{CH}(\text{CO}_2\text{H})\text{OMe}$ +35.3°, +16.7°; Et ether +48.6°, +25.1°; Pr ether, +15.4°, ...; Bu ether, ... ± 0°. All these ether acids have high viscosities and their mol. rotations become smaller in C_6H_6 soln. It should be noted that both ether acids and ether acid esters prepd. from *l*- α -chloroisocaproic acid with alcoholates become *d*-rotatory. (3) *Derivs. of l*- α -chloroisocaproic acid. $[\text{M}]$ and b . p. are: $\text{C}_6\text{H}_5\text{CHClCOCl}$ -9.6°, b_{11} 53-9°; $\text{C}_6\text{H}_5\text{CHClCO}_2\text{H}$ -23.0°, b_{17} 122-8°; $\text{C}_6\text{H}_5\text{CHClCO}_2\text{Me}$ -20.1°, b_{11} 75-6°; Et ester -32.8°, b_{10} 79-80°; Am ester -33.1°, b_{14} 113-4°. The l -rotatory power increases as the ester group becomes heavier. (4) *Et l*-acylleucates. As the acyl group becomes heavier, the l -rotation increases. $[\text{M}]$, elec. dissociation const ($K_a \times 10^6$) and b . p. of these derivs. are: $\text{C}_6\text{H}_5\text{CH}(\text{CO}_2\text{Et})\text{Cl}$ -32.8°, ...; $\text{C}_6\text{H}_5\text{CH}(\text{CO}_2\text{Et})\text{OBz}$ -39.5° (?), 6.7, b_{17} 174-6°; $\text{C}_6\text{H}_5\text{CH}(\text{CO}_2\text{Et})\text{OAc}$ -71.7°, 1.9, b_{21} 120-1°; $\text{C}_6\text{H}_5\text{CH}(\text{CO}_2\text{Et})\text{OCOC}_6\text{H}_5$ -137.5°, 1.6, b_{18} 125-8°; $\text{C}_6\text{H}_5\text{CH}(\text{CO}_2\text{Et})\text{Br}$ -116.5°, ... (5) In *acetylleucic acid esters* too, the l -rotation increases as the ester group becomes heavier. $[\text{M}]$ and b . p. are $\text{C}_6\text{H}_5\text{CH}(\text{OAc})\text{COCl}$ -19.9°, b 87°; $\text{C}_6\text{H}_5\text{CH}(\text{OAc})\text{CO}_2\text{H}$ -26.1°, b_{20} 155-7°; Me ester -71.7°, b_{20} 103-4°; Et ester -113.2°, b_{20} 120-1°; Bu ester -86.7° (?), ...; $\text{C}_6\text{H}_5\text{CH}(\text{OAc})\text{CONHPh}$ -2.8° (?), m 88-9°. (6) *Configuration of alkylleucic acids*. When the Na salt of Et *l*-leucate was treated with EtI , *d*-ethylleucic acid was obtained. The same salt treated with EtI and Ag_2O , gave *l*-ethylleucic acid, the Ca salt of which has $[\alpha] = -13.7^\circ$, which corresponds to that of the Ca salt of the *d*-variety ($[\alpha] = +13.6^\circ - 14.3^\circ$). Thus the configuration must be:



It is noted that the Ca salt of ethylleucic acid shows mutarotation in alc., which must be due to an equil. reaction: $[\text{C}_6\text{H}_5\text{CH}(\text{OEt})\text{CO}_2]_2\text{Ca} \cdot 2\text{H}_2\text{O} + \text{ROH} \rightleftharpoons [\text{C}_6\text{H}_5\text{CH}(\text{OEt})\text{CO}_2]\text{Ca} \cdot \text{H}_2\text{O} + \text{ROH}$

$\text{CO}_2\text{H}\cdot\text{Ca}\cdot\text{ROH} + 2\text{H}_2\text{O}$. (7) *Rotatory power and chem. structure*. K. prepd. several derivs. of Na leucate and methyl leucine in which the substituents were not asym., such as Me *l*-acetylleucate, methyl *l*-acetylleucine, Me *l*-isothiocyanoisocaproate, Me *l*-propylleucate, methyl *d*-propylleucine, and compared their rotatory powers. In *l*-rotatory substituted isocaproic Me esters when the substituted groups are heavier or their *l*-rotatory power is larger, the *l*-rotation of the final product becomes greater. (8) *Concn.-rotation and temp.-rotation curves* are given for methyl acetylleucine.

S. T.

Labile nature of the halogen atom in organic compounds. VIII. The action of hydrazine on the halogen derivatives of acetoacetic and benzoylacetic esters and of benzoylacetone. A. K. MACBETH. *J. Chem. Soc.* 123, 1122-30 (1923); cf. C. A. 17, 545.— γ -Br esters are unacted upon, while the α -comps. are quant. reduced by $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$, so that this reagent may be conveniently employed to det. the amt. of the α -form present and also to follow the α to γ change. $\text{AcCHClCO}_2\text{Et}$, b_{11} 88-9°, b_{760} 193°, n_D^{17} 1.4420, reacts quant. with N_2H_4 as do the following esters: $\text{AcCCl}_2\text{CO}_2\text{Et}$, b_{11} 91°, b_{718} 205-7°, n_D^{17} 1.4492; $\text{AcCMeClCO}_2\text{Et}$, b_{11} 81°, $\text{AcCEtClCO}_2\text{Et}$, b_{10} 90.5°, b_{770} 203-4°, n_D^{17} 1.4372; *Et* α -chloropropylacetate, b_{10} 108-10°, n_D^{18} 1.4420. $\text{CH}_3\text{BrCOCH}_2\text{CO}_2\text{Et}$ does not react with N_2H_4 , but $\text{AcCHBrCO}_2\text{Et}$ does, as do $\text{AcCBr}_2\text{CO}_2\text{Et}$, b_{11} 120-4°, $\text{AcCMeBrCO}_2\text{Et}$, b_{10} 93°, n_D^{17} 1.4560, and $\text{AcCEtBrCO}_2\text{Et}$, b_{11} 106°, n_D^{17} 1.4586. *Et* α -bromopropylacetate, b_{10} 130°, n_D^{18} 1.4610. *Et* α -bromobenzylacetate, b_{14} 180°, n_D^{18} 1.5280. *Et* α -chloroethylbenzylacetate, b_{14} 156°, n_D^{18} 1.5108. The α -Br deriv. b_{13} 181°, n_D^{18} 1.5350. These 4 derivs. react quant. with N_2H_4 . γ,γ -Dichlorobenzoylacetone, from SO_2Cl_2 and the γ -Cl deriv., refractive oil, b_{14} 158°, n_D^{18} 1.5530. Neither Cl deriv. reacts with N_2H_4 . While they have lachrymatory properties, they are not as irritating as the derivs. of CH_3Ac_2 . *4-p-Nitrobenzeneazo-3(5)-phenyl-1-p-nitrophenyl-5(3)-methylpyrazole*, by condensing the γ,γ -Cl₂ deriv. with 2 mols. $p\text{-O}_2\text{NC}_6\text{H}_4\text{NHNH}_2$, orange-red, m. 295-7°. **IX. The electrical conductivities and the reduction of derivatives of nitroform.** THOMAS HENDERSON, E. L. HIRST AND A. K. MACBETH. *Ibid* 1130-7.—In the cond. expts., the cells used were of the pattern described by Gomborg and Cone (*Ber.* 37, 2044), liquid SO_2 being used as the solvent. The vol. in l. contg. 1 g.-mol. of solute and the mol. cond. at the given diln. are given: EtBr , 17.4, 0.0057; $\text{C}_2\text{H}_5\text{Br}_2$, 27, 0.035; $\text{BrCH}(\text{CO}_2\text{Et})_2$, 39.3, 0.074; $\text{Br}_2\text{C}(\text{CO}_2\text{Et})_2$, 25, 0.009; $\text{C}(\text{NO}_2)_4$, 8, 0.000; $\text{ClC}(\text{NO}_2)_3$, 17, 0.009. $\text{BrC}(\text{NO}_2)_3$ showed a max. mol. cond., which gradually decreased with time. Four series of values are given. The equiv. cond. of Br, specially purified, for ν 10, was found after 2 min., 0.25; 5 min., 0.22; 10 min., 0.19; 20 min., 0.18; 40 min., 0.16. Reduction of $\text{ClC}(\text{NO}_2)_3$, $\text{BrC}(\text{NO}_2)_3$ or $\text{C}(\text{NO}_2)_4$ by Zn and HCl gave 20-30% guanidine-HCl (I). Fe and HCl gave about 50% I from $\text{C}(\text{NO}_2)_4$, 32-34% from $\text{ClC}(\text{NO}_2)_3$, and 30% from $\text{BrC}(\text{NO}_2)_3$. $\text{C}(\text{NO}_2)_4$ is also reduced by Fe and H_2SO_4 .

C. J. WEST

Ring-chain tautomerism. V. The effect of the *gem*-dipropyl grouping on the carbon tetrahedral angle. LESLIE BAINS AND J. F. THORPE. *J. Chem. Soc.* 123, 1206-14 (1923); cf. C. A. 17, 1431.—Earlier work has shown that the ring HO form is unstable in the Me₂ and MeEt series and that it passes at the moment of its formation into the open-chain isomeric keto acid. The 1st evidence of the stability of the ring structure is obtained in the Et₂ series, where the 2 isomeric compds., the open-chain keto acid and the HO ring acid, are tautomeric. In the case of the Pr₂ deriv., the ratio is 71:29 in favor of the HO ring, which is appreciably higher than the 62:38 found for the Et₂ deriv. This is in accordance with the view that the increase in the no. of C atoms in the chain forming the *gem*-grouping increases the stability of a 3-membered ring system formed by the other 2 valencies. β,β -Dipropylglutaric anhydride, b_{12} 173-4°, m. 24-5°, results by heating the acid with excess of AcCl for 3 hrs. *Anilic acid*, m. 160-1°. α,α' -Dibromo di-Et ester, golden yellow oil, which upon distn. *in vacuo* yields the lactone of the EtH acid (I), $\text{C}_{10}\text{H}_{16}\text{O}_4\text{Br}_2$, b_{14} 190-1°, which is probably a mixt. of the *cis*- and *trans*-forms. The acid ester could not be distd. without decompn. The free α,α' -di-Br acid, m. 155° (decompn.), results by pouring the crude bromination product into HCO_2H . The lactone of the α -bromo- α' -hydroxy acid, m. 135-6°, results by heating the Br₂ acid with glacial AcOH for a few min. I with KOH gives α -keto- β,β -dipropylglutaric acid, m. 104-4.5°, the semicarbazone of which m. 184°. The other product of the hydrolysis is 3,3-dipropylcyclopropan-1-ol-1,2-dicarboxylic acid, m. 214°; this is best prepd. by prolonged boiling of the keto acid with 60% KOH. The NH_4 salt is decompd. by boiling H_2O . Equil. is obtained by heating either acid with 60% aq. KOH for 6 hrs., the ratio of HO acid to keto acid being 71:29. The reaction is a unimol. one.

C. J. WEST

Conversion of malonic acid into *d*-malic acid. ALBX. MCKENZIE AND H. J. PLENDERLEITH. *J. Chem. Soc.* 123, 1090-6(1923).— $\text{Cl}_3\text{CCH}(\text{OH})\text{CH}_2\text{CO}_2\text{H}$ is conveniently prep'd. by condensing $\text{CH}_2(\text{CO}_2\text{H})_2$ and Cl_3CCHO with $\text{C}_6\text{H}_5\text{N}$. The acid may be resolved by means of quinine, the *quinine l*-salt sepg. 1st and m. 208° ; 100 cc. EtOH at 29.5° contains 0.44 g. salt. *l*- γ,γ,γ -Trichloro- β -hydroxybutyric acid, m. $104-5^\circ$; $[\alpha]_D^{17} -29.6^\circ$ (EtOH, c 1.5528); $[\alpha]_D^{15.6} -30.1^\circ$ (EtOH, c 4.004); $[\alpha]_{5461}^{15} -34.6$ (EtOH, c 4.004); $[\alpha]_D^{16.5} -22.5^\circ$ (AcMe, c 1.553); $[\alpha]_{5451}^{16.5} -25.1$ (AcMe, c 1.553). The *d*-acid has $[\alpha]_D^{16.5} 28^\circ$ (EtOH, c 1.551); $[\alpha]_{5461}^{16.5} 34.8$ (EtOH, c 1.551); $[\alpha]_D^{15} 22.9$ (AcMe, c 1.5528); $[\alpha]_{5461}^{15} 26.1$ (AcMe, c 1.5528). $\text{Ba}(\text{OH})_2$ and the *l*-acid gave *Ba d*-malate, with $a_{441} 3.15^\circ$. With the calcd. amt. of $(\text{CO}_2\text{H})_2$, *d*-malic acid, m. $99-9.5^\circ$, was obtained. 0.2233 g. with 0.5152 g. NH_4 molybdate gave $[\alpha]_D^{14.5} -550$. C. J. WEST

Action of molybdic acid upon the rotation of tartaric and malic esters. E. DARMOIS. *Compt. rend.* 176, 1140-2(1923).—When solus. of MoO_3 and esters of tartaric acid were mixed together, the rotation increased with time until a max. value was reached. This value depended upon the ester used, the temp., and the ratio of MoO_3 to ester. No change was produced in the rate at which the max. value of the rotation was reached when quantities of KOH less than 0.25 that needed to form K_2MoO_4 were added; with larger quantities of KOH the max. was reached more rapidly. The action of MoO_3 on malic esters was negligible in the cold, but became rapid with rising temp.

T. S. CARSWELL

Cyanurilphosphinimine and the pyrogenetic decomposition of the ethyl and methyl esters of normal cyanuric acid. W. KESTING. *J. prakt. Chem.* 105, 242-50(1923).— Ph_3P and cyanuril triazide in Et_2O or $\text{C}_6\text{H}_5\text{Me}$ form cyanurilditriphenylphosphinimine monoazide (I), m. 243° (decompn.). It has no explosive properties and burns quietly. If I is heated with Ph_3P at $170-80^\circ$, either alone or in a high boiling solvent, cyanurilditriphenylphosphinimine, m. 239° , results as a gray-white powder; BzOEt forms an addn. product consisting of 1 mol. of each of the components; EtOH apparently forms a similar addn. product. It does not react with CO_2 . CS_2 reacts, if heated in a bomb tube, but no definite reaction products were isolated. The pyrogenetic decompn. of tri-Et cyanurate (by slowly passing the vapors in a high vacuum over a Pt spiral heated to a pale red) gives HCNO and C_2H_2 .

C. J. WEST

Interaction of hydrogen sulfide, thiocyanogen and thiocyanic acid with unsaturated compounds. FREDERICK CHALLENGER, A. L. SMITH AND F. J. PAYTON. *J. Chem. Soc.* 123, 1046-55(1923).—Cl and carvone hydrosulfide (I) in CHCl_3 react at 20° with the evolution of HCl. With more than 4 atoms Cl at higher temp. H_2S is eliminated. At room temp. Br decomps. I, giving HBr, H_2S and SBr; a dil. soln. of Br in CHCl_3 at -15° , however, leads to the formation of a tetrabromide, m. $110-5^\circ$ (decompn.). This indicates the formula $[\text{MeCH.CO.CH}_2.\text{CH}(\text{CMe}:\text{CH}_2).\text{CH}_2.\text{CH}]_4$. I.

NH_4OH with I, gives H_2S , some I and a small amt. of carboxime. A small amt. of I is obtained by passing H_2S into an NH_3 -EtOH soln. of carboxime. I in CHCl_3 , treated with HgCl_2 in Et_2O , gives a ppt., probably $2\text{HgS}.\text{HgCl}_2$. Cold Ac_2O does not react with I, while glacial AcOH slowly evolves H_2S . Zn and AcOH or HCl cause the elimination of H_2S , even in the cold; this occurs with Zn and NH_4Cl on warming. H in presence of colloidal Pt failed to react. Ph_3Sb and SCN in Et_2O give triphenylstibine dithiocyanate (II), m. $105-6$, decomps. 250° . Ph_3SbCl_2 and $\text{Pb}(\text{SCN})_2$ give triphenylstibine hydroxythiocyanate (III), m. $227-8^\circ$, together with II. II is converted into III by heating with H_2O . In the case of Ph_3As , the dithiocyanate is not formed, the product being triphenylarsine hydroxythiocyanate, m. 110° (decompn.), also obtained by the action of $\text{Pb}(\text{SCN})_2$ upon Ph_3AsCl_2 or $\text{Ph}_3\text{As}(\text{OH})\text{Cl}$. It reacts instantly with warm EtOH-AgNO₃ giving AgSCN. At its m. p. it decomps. with evolution of NH_3 and an odor of PhSCN. On further heating, $(\text{Ph}_3\text{As})_2\text{S}$ is formed. HCNS and Ph_3Bi give Ph_3BiSCN and probably $\text{PhBi}(\text{SCN})_2$. Ph_3P and HSCN react slowly and after 1 month some Ph_3PNS was isolated, which was also formed in the reaction with SCN. Other unsatd. compds. (amylenes, benzylideneacetone, carvone, Et cinnamate, etc.) react with SCN, while *l*-pinene reacts with HSCN; these products are being investigated.

C. J. WEST

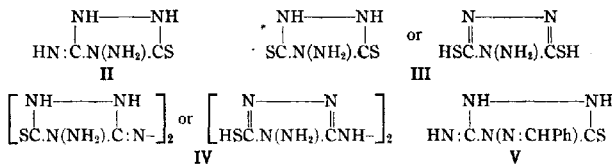
Decomposition of carbamic acid azide, NH_2CON_3 , alone and in aromatic hydrocarbons. THEODOR CURTIUS AND FRIEDRICH SCHMIDT. *J. prakt. Chem.* 105, 177-98(1923).— NH_2CON_3 (I) is not changed by boiling with Et_2O . In abs. alc. $\text{H}_2\text{NCO}_2\text{Et}$ and NH_3 are formed. Neutralization of I with 0.1 N NaOH and concn. gave NaN_3 . Conc'd. HCl gave only NH_4Cl . I is not changed by boiling C_6H_6 but in boiling C_7H_8 gas evolution ceases after 80 hrs. 0.1 mol I gave 1300 cc. N, about 0.6 of the theoretical. Some

of the remaining N is found as N_2H (1.7 g. recovered, theory 4.3 g.). The ppt. formed during the boiling is cyanuric acid. The C_4H_8 soln. contained some $CO(NHC_2H_5)_2$. In boiling $C_4H_8Me_2$ the decompn. required 9 hrs.; the products were N_2 , N_2H , some CO_2 , cyanuric acid, some $(NHCONH_2)_2$ and $CO(NHC_2H_5Me_2)_2$. Practically the same products were obtained when I was heated with C_4H_8 in a sealed tube at $100-15^\circ$ for 8 hrs., excepting that urazole was also isolated. When I was heated at 120° , 5 g. gave 800 cc. N_2 , 1.1 g. N_2H and about 2 g. solid residue, consisting of cyanuric acid (0.37 g.), urazole, $(NHCONH_2)_2$ and NH_4NO_3 . The compd. $CO(NHNHCONH)_2$, heated with H_2O at 150° , gives aminourazole, besides $CO(NHNH_2)_2$. C. J. WEST

The action of diazomethane on xanthosine. P. A. LEVENE. *J. Biol. Chem.* **55**, 437-42 (1923).—*Dimethylxanthosine*, $[\alpha]_D^{20} -28^\circ$, from CH_3N_2 and xanthosine in MeOH, yields 1,3-dimethylxanthine on hydrolysis. Thus is it evident that in xanthosine the ribose radical is attached to the 7-N atom of the base and xanthosine may, therefore, be regarded as 7-ribosexanthine. A. P. LOTHROP

Ring closures in dicarboxhydrazides containing sulfur. III. Action of hydrazine on hydrazodicarboxthioamide. F. ARNDT AND FRANZISKA BIELICH. *Ber.* **56B**, 809-17 (1923); cf. *C. A.* **16**, 2500.—Purgotti and Viganò obtained by the action of N_2H_4 on $(NHCSNH_2)_2$ a compd. which they believed to be a dithio-*p*-urazine but which Stollé concluded, from analogy with the S-free compds., to be *N*(4)-aminodithiourazole (I) (*C. A.* **1**, 2479). Repetition of P. and V.'s work, in which his directions were followed exactly, gave results different from his. The cryst. ppt. obtained by adding HCl to the soln. of the products of the reaction between $(NHCSNH_2)_2$ and a slight excess of $N_2H_4 \cdot H_2O$ in boiling alc. is a mixt. of several Cl-free acid substances, present before the addn. of the HCl as easily sol. NH_4 or N_2H_4 salts. The acid filtrate also contains an amphoteric substance (II), which can be pptd. by hydrolysis with NaOAc. The above acid mixt. contains considerable unchanged $(NHCSNH_2)_2$ and 2 other products (III and IV), which can be freed from the $(NHCSNH_2)_2$ only with difficulty. When, however, a somewhat greater excess of N_2H_4 (2.5-3.0 mols.) is used in the reaction, it is usually possible to obtain a $(NHCSNH_2)_2$ -free mixt. of III and IV, which can then be sepd. by taking advantage of their different acidities. In aq. instead of alc. soln., the yield of III and IV is increased at the expense of II. II is *N*(4)-aminoiminothiourazole, the strongly acid III is the true I and differs completely from P. and V.'s compd., while the more weakly acid IV, which is the chief product, is very probably 4,4'-diamino-hydrazoithiourazole. II, obtained in 1.5-2.0 g. yield from 4.5 g. $(NHCSNH_2)_2$ and 4-4.5 g. $N_2H_4 \cdot H_2O$ refluxed 2 hrs. in alc., m. $240-2^\circ$ (decompn.), is amphoteric with the acid properties more pronounced, dissolves in alkalis, NH_4OH and mineral acids but not in AcOH (the NaOH soln. is yellow), foams vigorously when treated with $K_3Fe(CN)_6$, the soln. becoming brownish; 2 *N* HNO_3 at first dissolves it like other mineral acids but on scratching in the cold a nitrate, m. 153° (violent NO evolution), seps.; alk. Me_2SO_4 methylates it but the Me ether is so easily sol. in H_2O that it cannot be isolated from even a very concd. soln.; II in HCl shaken with BzH yields a yellowish benzal deriv. (V), m. 274° , sol. in alkalis and NH_4OH with intense yellow color but gradually hydrolyzed with regeneration of the BzH and gives with Me_2SO_4 in NH_4OH a *S*-Me ether, sinters 235° , m. 242° , insol. in acids and bases, mol. wt. in freezing camphor 204-31. For the prepn. of III and IV, 10 g. $(NHCSNH_2)_2$ and 9-10 g. $N_2H_4 \cdot H_2O$ in 60-75 cc. H_2O are refluxed 262 hrs. They are isolated from the cryst. mixt. pptd. by HCl by dissolving in boiling 2 *N* $(NH_4)_2CO_3$; on cooling IV seps. and the filtrate, concd. to 0.5 its vol. until the hot, but not boiling, soln. just still faintly smells of NH_3 , deposits more IV; the filtrate from this, when treated with concd. HCl, yields III, m. 228° (decompn.), easily sol. in NaOH, NH_4OH , Na_2CO_3 , $(NH_4)_2CO_3$, converted in H_2O or, better, in HCl by $FeCl_3$ into a disulfide, sol. in alkalis, m. around 214° (decompn.), reduced back to III by Zn dust in aq. NH_4OH . Di-Ag salt of III; Ba salt, $(C_4H_5N_4S_2)_2Ba$; benzal deriv., from III in hot HCl with BzH, yellow, m. 136° , sol. in alkalis with intense yellow color but quickly hydrolyzed, gives with Me_2SO_4 in NH_4OH an oily Me ether; dibenzyl ether, from III in alc. KOH warmed a few min. with 2 mols. $PhCH_2Cl$, m. 147° , insol. in alkalis and acids, gives with BzH no condensation product which can be isolated. IV always melts sharply but the m. p. of different preps. may vary from 207° to 225° (apparently owing to tautomeric rearrangement or possibly to stereoisomerism); it dissolves easily in alkalis, NH_4OH and Na_2CO_3 but is insol. in $(NH_4)_2CO_3$ and $BaCO_3$ suspension, is repptd. unchanged by acids, decolorizes $FeCl_3$ and I in acid soln. but no disulfide is pptd.; treated in just enough NaOH for soln. with $K_3Fe(CN)_6$ it seps. unchanged but with an excess of the 2 reagents it foams and gives a cherry-red color; the Ag salt darkens when filtered off; IV reduces $NH_3 \cdot AgNO_3$ to metallic Ag; benzal deriv., m. 215° (decompn.), sol. in alkalis with rapid hydrolysis; dibenzyl ether, m. 214°

(decompn.), sol. in mineral acids but soon deposits the salts (*nitrate*, m. 132°), yields in HCl with BzH the *HCl salt*, m. 181°, of the *benzal deriv.*, m. 136-7°, also obtained from the benzal deriv. of IV in boiling alc. with the calcd. amt. of PhCH_2Cl treated dropwise with NaOH, mol. wt. in freezing camphor 538-57.



C. A. R.

The mannan present in vegetable ivory. JOCELYN PATTERSON. *J. Chem. Soc.* 123, 1139-49 (1923).—Vegetable ivory meal was 1st subjected to a preliminary treatment with 5 times its wt. of 10% NaOH for 0.5 hr., then with 20% NaOH, from which EtOH threw down the NaOH-polysaccharide complex as a light gelatinous ppt. Soln. in H_2O , addn. of dil. AcOH to acid reaction and short boiling gave the mannan as a colorless powder in 8-10% yield. Hydrolysis with dil. HCl gave 80% of the theory of mannose. Mannan is not readily attacked by acid-MeOH and the conversion to Me mannoside was carried out through the *triacetate*, m. 128-45°, $[\alpha]_D -3^\circ$, which was prepd. by treating the mannan with AcOH and Ac_2O contg. SO_2Cl_2 as a catalyst. This is quant. converted into Me mannoside, the α -form being in large excess. Repeated alkylation gave a *trimethylmannan*, a slightly yellow, amorphous, somewhat hygroscopic powder. It displayed a marked tendency to form a jelly in CHCl_3 , etc., which suggests exceedingly large mols. or a high degree of polymerization of simple units. Hydrolysis with 8% HCl gave a viscous yellow sirup, $n_D -1.4780$, $[\alpha]_D -5.8^\circ$ in H_2O , which consisted almost entirely of trimethylmannose. The *l*-rotation was unexpected. The nature of the sugar was detd. by conversion into tri- and then tetramethyl- α -methylmannoside. The results seem to justify the conclusion that mannan is wholly a polyanhydromannose.

C. J. WEST

Structure of sucrose. MAX BERGMANN. *J. Chem. Soc.* 123, 1277-9 (1923).—B. points out that he also (*C. A.* 16, 3874) questioned the ethylene-oxide structure of sucrose (cf. Haworth and Linnel, *C. A.* 17, 1626). Preliminary work with Correns led to a compd. $\text{C}_6\text{H}_8\text{O}(\text{OMe})_4$ from the fructose portion of methylated sucrose, which is unsatd. The dark red color with fuming HCl proves that the oxide ring is present as a 5- or 6-membered ring.

C. J. WEST

Cellulose xanthates (preliminary communication). R. WOLFFENSTEIN AND E. OSSER. *Ber.* 56B, 785-7 (1923).—The cellulose xanthates are in general formed from alkali cellulose and CS_2 according to the equation $\text{C}_6\text{H}_7\text{O}_2(\text{ONa})_2 + \text{CS}_2 = \text{NaOC}_6\text{H}_4\text{O}_2(\text{OCS}_2\text{Na})$, the cellulose reacting with only 2 free HO groups, even in the presence of an excess of alkali, whence it must be concluded that in the prepn. of the Na cellulose free HO groups are converted into ether-like groupings by the alkali. Similar conditions exist in the acetylcelluloses, in which, however, three HO groups take part in the acetate formation. Since it was found that alkali, under the conditions in which it is used in the prepn. of the xanthates, splits off the Ac groups from acetylcelluloses (as shown by the fact that after pptn. of the Na cellulose with alc. NaOAc is present in the filtrate) it seemed probable that cellulose xanthates prepd. from acetylcelluloses might contain more than 2 xanthic acid groups; as a matter of fact when 10 g. samples of various Me_2CO -sol. acetylcelluloses (both com. products and those prepd. in W. and O.'s lab.) were allowed to stand 3 days at room temp. in a closed vessel with 80 cc. of NaOH (d. 1.2) and 12 cc. CS_2 there resulted sirupy dark brown liquids which coagulated after about 10 days at room temp. and which, after pptn. with 95% alc., washing with alc. and then with Et_2O and drying *in vacuo* over P_2O_5 , had compns. corresponding approx. to xanthates, $\text{C}_6\text{H}_7(\text{ONa})_2(\text{OCS}_2\text{Na})_2$, derived from a cellulose with 5 reactive HO groups (as a matter of fact, the amt. of alkali calcd. for the setting free of 5 HO groups was used in their prepn.). These products also differ in appearance and in their behavior from those prepd. from alkali celluloses; they are pptd. by alc. as dark brown gummy masses, evolve H_2S on standing in moist air more strongly than those prepd. from alkali celluloses, and their heavy-metal salts (Pb and Cu) decomp. more readily into the corresponding sulfides.

C. A. R.

Pentosans. V. Hydrolysis of xylan with dilute nitric acid. EMIL HEUSER AND GEORG JAYME. *J. prakt. Chem.* 105, 232-41 (1923); cf. *C. A.* 17, 729.—Xylan, heated with 45 parts 3% HNO_3 (d. 1.0175) for 60 min. gives an 84% yield of *l*-xylose. In addn. to the larger yields, other advantages of this method of hydrolysis are: no furfural is formed, less BaCO_3 is required for neutralization (as compared with the previous use of 5% H_2SO_4), considerable time is saved, especially in filtration. In using Bertrand's method for the detn. of xylose, the max. yield is found by heating for 60 min. (97.04% of theory). When heated with 3% HNO_3 at 100° for 1-2 min. xylan goes completely into soln., probably in part as a xylodextrin, since Bertrand's method shows only 58.7% of xylose in the soln. The course of the hydrolysis is shown in a curve. **VI. The oxidation of xylans with nitric acid.** *Ibid.* 283-7.—Xylan, heated 16 hrs. with 2.5 parts HNO_3 (d. 1.2) at 45° , gives 21.7% trihydroxyglutaric acid (as the Ca salt). If 5 parts HNO_3 are used the greater part of the oxidation product is $(\text{CO}_2\text{H})_2$.

C. J. WEST

Further experiments on the catalytic dehydrogenation of hexahydroaromatic hydrocarbons. N. D. ZELINSKII. *Ber.* 56B, 787-8 (1923); cf. *C. A.* 7, 2224.—*o*-Dimethylcyclohexane passed 3 times through tubes contg. Pt black at $300-10^\circ$ was almost completely dehydrogenated to *o*-xylene; similar results were obtained with the *m*- and *p*-isomers and with menthane passed over heated Pd black.

C. A. R.

Direct introduction of substituents into the benzene nucleus. P. G. VAN DER VLIET. *Chem. Weekblad* 20, 279 (1923). The rule of substitution of Lely. P. H. HERMANS. *Ibid.* 20, 279-80. The rule of substitution of C. W. A. Lely. J. JURGENS. *Ibid.* 297.—Polemical (cf. *C. A.* 17, 1788).

R. BEUTNER

Quinonemethides and pseudophenol halides. HANS LINDEMANN. *Ann.* 431, 270-300 (1923).—An investigation has been carried out with *o*- and *p*-hydroxybenzal halides and the compds. resulting by splitting of HX from them. 3,5,4-Br₃(HO)-C₆H₃CHO, m. 185° . Triacetate, m. 125° . 4-MeO deriv., m. $82-6^\circ$, by warming the Na salt of the aldehyde with Me_2SO_4 . The benzal bromide m. $60-4^\circ$. 3,5-Dibromo-4-hydroxybenzal bromide (I), m. $98-101.5^\circ$, results from the aldehyde and PBr₃ in C₆H₆. Hot AcOH or aq. or alc. KOH transforms it into the aldehyde. The acetate, m. 80° , results by short warming with Ac₂O and a few drops of concd. H_2SO_4 . If I in a little Et₂O is shaken 2 min. with 2 vols. of 2 N AcONa, 3,5-dibromoquinone bromomethide, C₆H₃OBr₂, results, pale yellow, m. 120° if crystd. from CHCl₃, but from C₆H₆ or CS₂ a polymerized form is usually obtained, reddening at 120° and m. about 200° . H₂O transforms it to the aldehyde. HBr gives I, HCl the benzal bromide chloride, m. $70-4^\circ$. PhNH₂ gives the anil, orange, m. $150-2^\circ$, also obtained from the aldehyde or I with PhNH₂. NH₄OH or aq. alkali at first gives a deep blue soln., gradually changing to a pale yellow which contains the alkali salt of the aldehyde. 2-Hydroxy-4,6-dimethylbenzaldehyde, m. 48° . Phenylhydrazone, m. 127° . 3,5-Dibromo-2,6-dimethyl-4-hydroxybenzaldehyde, m. 181° . Triacetate, m. 114° . Monoacetate, m. 149° . The benzal bromide m. 154° . Acetate, m. 152° . Anil, m. 212° . 3,5-Dibromo-2,6-dimethylquinone bromomethide, C₆H₃OBr₂, pale yellow, m. about 200° . Polymerization proceeds more rapidly in the hot. 3,5-Dibromo-2,6-dimethyl-4-hydroxybenzal chloride, m. 153° . Acetate, m. 128° . The quinone chloromethide is pale yellow and m. 132° , then 242° . 3,5-Dibromo-4-hydroxy-2,6-dimethylbenzal chloride bromide, m. 151° . Acetate, m. 138° .

C. J. WEST

Influence of nitro groups on the reactivity of substituents in the benzene nucleus. VII. Reactions of 2,5- and 4,5-dinitro-*m*-xylenes. KATHLEEN IBBOTSON AND JAMES KENNER. *J. Chem. Soc.* 123, 1260-8 (1923); cf. *C. A.* 16, 2123.—The 1st part of the article discusses the various electronic theories of valence. When various NO₂ groups are equally or approx. equally situated in respect of steric conditions, the mobile substituent is that favored by the directive influence of the majority of the substituents. The directive factor is exactly expressed in terms of polarity as the "tendency to certain mol. distribution of affinity." The 1st of the 2 factors above considered is the more powerful. It might be expected that a sufficient accumulation of substituents would enable the directive to overpower the steric factor. This is observed in the case of 1,3,2,4,5-C₆HMe₂(NO₂)₂ and it was therefore desirable to investigate the 2,5-(O₂N)₂ deriv. In this case the 2-NO₂ group is displaced by NH₂, as is also the case in the 4-NO₂ group in the 4,5-(O₂N)₂ deriv. 4-Nitro-*sym*-*m*-xylydine acetyl deriv., m. 114° . 2-Nitro acetyl deriv., m. 163° . The partial reduction of 1,3,2,4,6-C₆HMe₂(NO₂)₂ with (NH₄)₂S gave 2,4-dinitro-6-amino-*m*-xylene, amber-colored, m. 193° ; acetyl deriv., m. 176° ; benzoyl deriv., m. 218° . 5-Nitro-2-*m*-xylydine, by the action of NH₃ upon the 2,5-(O₂N)₂ deriv. in MeOH, orange-yellow, m. 158° ; acetyl deriv., m. 178° .

C. J. WEST

Influence of *sym*-trinitrobenzene on reactions in which arylamines are involved.

J. J. SUDBOROUGH AND R. C. SHAH. *J. Indian Inst. Sci.* 5, 29-35(1922).—In all 5 reactions studied (alkylation of PhNH_2 , prepn. of $\text{PhNHC}_{10}\text{H}_7$, PhN:CPh_2 ,

$\text{C}_6\text{H}_5\text{—}\begin{array}{c} \text{NH} \\ \diagup \quad \diagdown \\ \text{C}_6\text{H}_4 \quad \text{S} \quad \text{C}_6\text{H}_4 \end{array}$ and acetylation of PhNH_2) it is clear that *sym*- $\text{C}_6\text{H}_5(\text{NO}_2)_2$ has no catalyzing effect, though in the 1st 4 reactions I acts as a strong positive catalyst.

C. J. WEST

Picrates of some tertiary amines. Reply to Prof. B. K. Singh. SHIGERU KOMATSU AND UMESABURO TAKIMOTO. *Mem. Coll. Sci. Kyoto Imp. Univ.* 6, No. 4, 173-6(1923); cf. *C. A.* 11, 1346.—S. has criticized K.'s work on the identification of tert. amines by the picrate method, saying the amines were impure. Phys. consts. are given of specially purified PhNMe_2 , PhNEt_2 and PhNMeEt (b. p., d_4^{25} , n_D^{25}) and the picrates prepd. from them. The m. ps. of the latter are: PhNMe_2 , 158-9.5°; PhNEt_2 , 137-8°; PhNMeEt , 127-8.3°; they are several degrees lower than those reported by S. C. J. WEST

Preparation of methyl red. A. W. SCHORGER. *Ind. Eng. Chem.* 15, 742-3(1923).—Five lbs. *o*- $\text{H}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$ are dissolved in 100 lbs. H_2O , 40 lbs. ice and HCl equiv. to 2.5 lbs. anhyd. acid and 2.5 lbs. NaNO_2 added. After 0.5 hr. this is treated with 4.6 lbs. PhNMe_2 in 30 lbs. H_2O , 15 lbs. ice and 1.4 lbs. HCl (anhyd.); after 15-20 min. 3.5 lbs. Na_2CO_3 and then 1 lb. AcONa are added. After standing overnight, the mixt. is raised to 40-50° (steam) and then filtered (filter press). The amorphous product is dissolved in NaOH (2 lbs. in sufficient H_2O to give a final soln. of 30 lbs.), filtered and 1 vol. of this soln. added to 1 vol. concd. HCl in 3 vols. H_2O at the b. p. The steel-blue HCl salt crystallizes on cooling in about 10 lb. yield. On crystn. from glacial AcOH , is obtained the violet free base contg. 2 AcOH of crystn., which is lost at 105°. It may also be crystd. by adding petrol. ether to a CHCl_3 soln. or from C_6H_6 , either method being preferable to the use of AcOH . When the alk. soln. of the indicator cools, the reddish brown Na salt, which is H_2O -sol., seps. The other forms must be used in alc. soln. C. J. WEST

Organo-derivatives of thallium. VI. Compounds of the type R_2TlX . A. E. GODDARD. *J. Chem. Soc.* 123, 1161-72(1923); cf. *C. A.* 16, 1939.—The following derivatives of thalliumdiphenyl hydroxide were prepd.: *Acid propionate*, m. 164°; *acid valerate*, m. 176°; *acid butyrate*, m. 171°; pptd. from AcMe with petrol. ether the *normal butyrate*, m. 230°, is obtained; *acid hexoate*, m. 191°; *normal hexoate*, m. 208°; *n-octolate*, m. 195°; *p-nitrobenzoate*, faintly yellow, m. 228°; *o-bromobenzoate*, cream, m. 243°; *m-bromobenzoate*, m. 247°; *o-nitrophenoxide*, bright orange, m. 247° to a blood-red liquid; it is decolorized by AcOEt ; *p-nitrophenoxide*, bright yellow, m. 251° (decompn.); *1,2-naphthoquinone-1-oximate*, green, m. 238°; *trinitro-m-tolylxide*, yellow, m. 231°; *trinitro- α -naphthoxide*, brilliant orange, m. 232° to a blood-red liquid; *thalliumdiethyl hexanitrodiphenylamine*, brilliant carmine with violet reflex, m. 224°; *p-benzoquinone-oximate*, blue-black with violet reflex; *1,2-naphthoquinone-1-oximate*, deep green, m. 217°; *2,6-dinitrophenoxide*, deep orange, m. 190° (decompn.); *dinitro-*o*-tolylxide*, terra-cotta, exploded 219°; *trinitro-m-tolylxide*, brilliant yellow, sinters 203°, decomp. 214°; *trinitro- α -naphthoxide*, orange, m. 220° (decompn.); *dinitro- β -naphthoxide*, dull greenish yellow, starts to decomp. 208°, m. 280°; *2,4-dinitronaphthoxide*, pale orange, darkens 217°, does not m. 280°. Soly. and color relations of the salts are discussed. HgPr_2 was prepd. from PrMgBr and HgBr_2 . TiCl_3 with HgPr_2 gives TiCl , Pr_2TiCl and HgPrCl . $\text{Hg}(\text{iso-Am})_2$ and TiCl_3 gave only TiCl and iso-AmHgCl . $\text{Hg}(\text{PhCH}_2)_2$ and TiCl_3 gave TiCl , PhCH_2HgCl and traces of $(\text{PhCH}_2)_2$. PhCH_2HgEt and TiCl_3 gave TiCl , EtHgCl and PhCH_2HgCl . 2-Iodomercurithiophene and TiCl_3 gave TiCl and the 2-Cl deriv. Ph_2SbCl_2 and TiCl_3 , heated in PhMe_2 and then allowed to stand for some months, gave TiCl and Sb . *Tri-p-xylylstibine*, m. 174.5°, through the Grignard reaction from SbCl_3 with TiCl_3 it yields TiCl and *tri-p-xylylstibine dichloride*, m. 230-1°. (*p*- $\text{Me}_2\text{C}_6\text{H}_3$) $_2\text{As}$ and TiCl_3 give TiCl and *p*- $\text{Me}_2\text{C}_6\text{H}_3\text{AsCl}_2$. The m-compd. behaves similarly. Et_2SnCl_2 and TiCl_3 give TiCl and Et_2SnCl_2 . Et_2SnI_2 and TiCl_3 react to give Et_2SnCl_2 , TiI and ICl . Me_2SnEt_2 and TiCl_3 react to give TiCl , Et_2TiCl , and Me_2SnCl_2 . *Pb tri-m-xylyl*, by the Grignard reagent, pale yellow, m. 233.5°. It reacts with TiCl_3 to give TiCl and *lead di-m-xylyl dichloride*. Ph_2TiCl is decompd. by ICl forming PhCl , TiCl and I_2 . Summary of the work in this field shows that substances of the type R_4M give rise to R_2MX_2 and R_2TlX ; R_4MX and $\text{R}_4\text{MR}'$ yield TiCl and R_2MX_2 and R_2MX , resp.; $\text{R}_2\text{MR}'$ produces $\text{R}'\text{MX}_2$ and R_2TlX , where R' is the radical of lower mol. wt.; and R_2MX_2 merely exchanges its halogen X_2 , should it be Br or I , for the Cl of the TiCl_3 . C. J. WEST

Nitro derivatives of *m*-cresol. G. P. GIBSON. *J. Chem. Soc.* 123, 1269-77(1923).—Repetition of Khotinsky and Jacopson-Jacopmann's work (*C. A.* 3, 2947) showed that

3,2-Me(C₂N)C₆H₄OH was obtained in very small yield by the direct nitration of *m*-MeC₆H₄OH. It may be prepd. by gradually adding a mixt. of fuming H₂SO₄ and concd. HNO₃ to a cold soln. of *m*-MeC₆H₄OH in fuming H₂SO₄ (6-7% SO₃) and allowing to stand 24 hrs. Since the crude nitration product would not crystallize, it was acetylated and the pure Ac deriv. hydrolyzed. *2-Nitro-m-cresol*, bright yellow, m. 41°. The Na salt gives a deep crimson soln. *Acetate*, m. 59°. *Benzoate* (I), m. 79°. *Me ether*, m. 54° (K. and J.-J. give 88°). *4-Nitro acetate*, m. 48°; *6-nitro acetate*, m. 34°. Reduction of the Me ether with Fe and dil. AcOH gives *3-methoxy-o-toluidine*, m. 31°. *Benzoate*, m. 137°. *3-Methoxy-o-tolunitrile*, m. 64°. Hydrolysis gives the *amide*, m. 157° which, with HNO₃, yields *3-methoxy-o-toluic acid*, m. 112°. KMnO₄ gives 3-methoxyphthalic acid, thus establishing the constitution of the NO₂ deriv. The only impurity in the nitration product is the 4-NO₂ deriv. *N-Benzoyl-2-amino-m-cresol*, m. 189°, by reduction of I. The corresponding *4-deriv.* m. 169°. In dil. alkali these derivs. give a green soln., and yield yellow azo compds. *6-Amino-m-tolyl benzoate*, b₁₂ 220°, m. 92°; *HCl salt*. In the case of the 2- and 4- derivs., the Bz group wanders from the O to the N atom during the reduction.

C. J. WEST

The action of organo-magnesium compounds on the aminophenols. E. PUXEDDU. *Gazz. chim. ital.* 53, 99-105(1923).—The organo-Mg compds. react with amines thus (Meunier, *Bull. soc. chim.* [3] 29, 314(1903)): PhNH₂ + EtMgI → PhNHMgI + C₂H₆. With alcs. they react thus (Chugaev, *Ber.* 35, 3912(1902)): MeMgI + ROH → CH₄ + ROMgI. P. wished to study the influence of organo-Mg reagents on amino phenols and here reports results with 3-amino-*p*-cresol (I) and amino-*β*-naphthol (II). Both were prepd. by reducing hydroxyazo compds. with PhNHNH₂. Both the OH and NH₂ groups are present in unchanged form in I and II and a series of 5 possible Mg substitution and addn. products is possible depending upon whether 1 or both of these groups are reacted upon in the usual and known ways with the simultaneous evolution of a hydrocarbon gas. None of these is formed and no gas is evolved with either I or II. An addn. product with 2 mols. of EtMgBr for each mol. of I and II was obtained. This product with II treated with 2 mols. AcCl gave the di-Ac deriv. of II + C₂H₆ + 2MgBrCl. 5 g. hydroxyazocresol and 10 g. PhNHNH₂ were carefully heated until reduction was complete or gas was no longer evolved. The product (I) was crystd. from C₂H₆ + animal charcoal. EtMgI from 1.2 g. Mg was added drop by drop to I in Et₂O, giving the yellow addn. product 1,4,5-MeC₃H₃(OH.EtHGBr)NH₂.EtMgBr. Half of this with AcCl gave MeC₆H₃(OAc)NHAc, m. 157°. II was similarly obtained with benzeneazo-*β*-naphthol. The analogous addn. product with 2EtMgBr with AcCl gave the di-Ac deriv. of II, m. 264°.

E. J. WITZEMANN

Catalytic hydrogenation under pressure in the presence of nickel salts. III. Phenetidine. JULIUS V. BRAUN AND ERICH HAHN. *Ber.* 55B, 3770-9(1922); cf. C. A. 17, 1958, 1965.—The hydrogenation of *p*-EtOC₆H₄NH₂ with H at 6-7 atm. and at 220-30° in the presence of tetralin led to *p,p'*-diethoxyhexahydrodiphenylamine, b₁ 208-216°, sepd. by crystn. from petrol. ether into the *trans-form* (?) m. 78-9°, and the *cis-form* (?), m. 37-8°, the latter predominating. The former yields a quaternary methiodide, m. 156°, and an Ac deriv., m. 84°. Ac deriv. of the *cis-form*, b₁₈ 235-40°, m. 42-3°. NO deriv., m. 78°. The quaternary methiodide and chloride are both very hygroscopic. The chloroplatinate is orange-red. The constitution of the *cis-form* was established by the decompn. of the quaternary iodide, giving Δ²-tetrahydrophenetole, b. 158-60° (15% yield), which gives C₈H₁₀Br₂ with fuming HBr, and Me₂NC₆H₄OEt, m. 35-6°. The action of HCl splits off 1 or both of the Et groups, giving *p*-ethoxyphenyl-*p'*-hydroxycyclohexylamine (I) m. 84-5°; *bis-p*-nitrobenzyl compd., m. 192°. Upon distn. in *vacuo* H₂O is split off, probably giving *p*-ethoxyphenyltetrahydrophenylamine, b₁₆ 220-30°, but a pure product was not prepd. The *N*-Me deriv. behaves similarly, giving the *Me deriv.* of I, m. 72°, the *p*-nitrobenzoyl deriv. of which is pale yellow and m. 189°. If both Et groups are split off, *p*-hydroxyphenyl-*p'*-hydroxycyclohexylamine, m. 136-7°, results. A 2nd product of the reduction is the compd. C₂₀H₂₈O₂N₂, [EtNH(OEt)C₆H₄]₂ (?), m. 169-70°. *Di-NO deriv.*, pale yellow, m. 190°. *Di-Ac deriv.*, m. 240°. *Di-HCl salt*, decomps. 290° and loses HCl in *vacuo* at 100°. C. J. WEST

Benzaldehyde copper and the heterogeneous velocity of formation of this compound. A. L. BERNOULLI AND FRITZ SCHAAF. *Helvetica Chim. Acta* 5, 721-31(1922).—In an investigation of the kinetics of BzH it was found that in PhCl or PhBr Cu dissolved with an emerald-green color, but that in BzH or the solvent alone there was no action. The rate of soln. is dependent upon the surface of the Cu exposed (but not upon the total wt. of the Cu), is proportional to the time and appears to bear some relation to the fluidity of the BzH solvent; the latter relation is shown by the following figures (the 1st value is the fluidity, the 2nd $v \times 10^7$, v being the sp. soln. velocity at 50°): AcOEt,

158.74, 128.9; PhMe, 138.07, 92.1; *m*-C₆H₄Me, 134.58, 80.2; C₆H₆, 129.43, 70.2; mesitylene, 124.35, 63.2; PhEt, 119.42, 58.0; PhCl, 108.03, 44.2; PhBr, 79.81, 15.5; PhI, 59.11, —; no action with EtOH and BzOCH₂Ph also. The effect of temp. follows: 25°, 21.4; 35°, 49.7; 40°, 73.2; 45°, 80.9; 50°, 100.8; 53°, 108.5°, 61°, 161.7; 65°, 173.2; 72°, 210.8; 79°, 302.9; 92° 475.7; 105°, 758.8. BzOH, added to the reaction mixt., retards considerably the soln. velocity. In PhMe at 50° the rate is a max. at a concn. of 16% BzH ($\nu \times 10^3$ 254.2); in C₆H₆ this max. is at 14% BzH (ν 92.54). Even with 98% BzH and 2% PhMe $\nu \times 10^3$ is 3.74. Benzaldehyde copper (diphenylcupriphen), PhCH—CHPh, decomps. 220°, green, sol. to the extent of 0.17% at 50° in PhMe

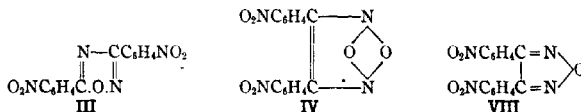
contg. 10% BzH. HNO₃ gives BzOH and Cu(NO₃)₂. CuO and CuS likewise are sol. in BzH-PhMe with a green color. Cu also dissolves in a PhMe soln. of *p*-MeC₆H₄CHO with a pale green color (ν 395.4), and in *p*-ClC₆H₄CHO with a deep green color (ν 167.1), but not in *p*-O₂NC₆H₄CHO. *p*-Chlorobenzaldehyde copper (di-*p*-chlorophenylcupriphen), green. Preliminary expts. indicated that other metals also dissolved in PhMe-BzH: Pb, ν 685.3; Zn, 285.7; Ag, 41.0; Mg, 27.9; Co, 27.1; Ni, Fe, Al, O. The resp. colors of the resulting solns. are: yellowish brown, green to brown, brownish black, yellowish brown, brown.

C. J. WEST

Isomerism of the oximes. XI. Carboethoxy derivatives. O. L. BRADY AND G. P. MCHUGH. *J. Chem. Soc.* 123, 1190-8(1923); cf. *C. A.* 10, 2578; 17, 90.—In the earlier work the action of ClCO₂Et on an alk. soln. of *p*-nitrobenz-anti-aldoxime resulted in a change of configuration, which appeared to justify the further study of this reagent with other aromatic aldoximes. The following carboethoxy derivs. were prepd. Benz-anti-aldoxime, m. 34-5°; the original oxime was obtained on hydrolysis. *o*-Chlorobenz-anti-aldoxime, m. 47°; *m*-deriv., m. 37°; *p*-deriv., m. 83°. Hydrolysis of each of these gave the original oxime. *o*-Methoxybenz-anti-aldoxime, m. 52°; hydrolysis regenerated the original oxime. *p*-Methoxybenz-syn-aldoxime, m. 74°. Hydrolysis with 2 *N* NaOH gave anisic acid. 3,4-Methylenedioxybenz-syn-aldoxime, m. 78°. Hydrolysis with 2 *N* NaOH gave CH₂O₂:C₆H₄COOH; heating on the H₂O-bath for 5 hrs. gave the nitrile. Treatment of the anti-oxime (as the Ag salt) with ClCO₂Et gave the above deriv., m. 77°. *o*-Nitrobenz-syn-aldoxime, by treating the Ag salt with ClCO₂Et, m. 42°. Heating with 2 *N* NaOH resulted in profound decompn. A suspension in 2 *N* NaOH, after 2-3 days, was changed into the nitrile. When boiled with EtOH for 1 hr., the oxime was recovered unchanged. *m*-Nitrobenz-syn-aldoxime, m. 138°; this is also converted to the nitrile on hydrolysis. 3-Nitro-4-dimethylaminobenz-anti-aldoxime, orange, m. 135°. Hydrolysis gave the original oxime, with some little acid. 6-Nitro-3,4-methylenedioxybenz-anti-aldoxime, pale yellow, m. 120°. Mild hydrolysis with NaOH regenerates the original oxime. When the syn-aldoximes in 2 *N* NaOH were shaken with slightly less than 1 mol. of ClCO₂Et in the cold, the products obtained proved to be the corresponding nitriles; even when shaken with ClCO₂Et in Et₂O *m*- and *p*-nitrobenz-syn-aldoximes still gave nitriles.

C. J. WEST

Peroxides of the monoximes. R. CIUSA AND E. PARISI. *Gazz. chim. ital.* 53, 143-9(1923).—C. has previously (*C. A.* 16, 556) pointed out the analogy between aldoximes and aldoximehydrazones. In this paper the prepn. and decompn. of *m*-nitrobenzaldehyde peroxide (I) is described. The best method of prepn. of I is to bubble N₂O₂ through *m*-O₂NC₆H₄CH:NOH (II) in Et₂O. I thus pptd., filtered off, washed with Et₂O and dried *in vacuo*, m. 131°. The prepn. of I with AmONO previously reported (Minunni, Ciusa, *J. prakt. Chem.* 73, 253(1906)) was repeated and the I now also m. 131°. II in 5% KOH soln. with K₂Fe(CN)₆ gives some I but mostly di-*m*-nitrophenyl-tetra-*a,b*-diazole (III), m. 168-9° (M. and C., *l. c.*) and some di-*m*-nitrobenzaldoxime peroxide (IV), m. 184°. II with alk. NaClO gives some I but more III. The filtrate from I prepd. by N₂O₂ was extd. with Na₂CO₃ and then with KOH. III and IV were



sepd. In this reaction C. and P. consider that O₂NC₆H₄C(NO₂):NOH is first formed and this by the loss of HNO₂ and HNO₃ gives O₂NC₆H₄C:N:O (V) and O₂NC₆H₄C:N (VI), resp. IV is then formed by the union of 2 mols. of V and III from 2 mols. VI. The filtrate from III and IV above was acidified, extd. with Et₂O and gave *m*-O₂NC₆H₄CH:

CO_2H (VII), m. 141° . A compd. that is probably di-*m*-nitrophenylfuran (VIII), m. $147.5-9.5^\circ$, was also isolated from the Et_2O soln. remaining after extg. III and IV; 5 g. I in 200 cc. C_6H_6 were heated 0.5 hr. at 50° and sepd. some unchanged I. From the C_6H_6 soln. IV, VIII, VII and some crystals, m. 124° , that were not identified, were sepd. The work is to be continued.

E. J. WITZEMANN

Chemistry of aldehydes. III. The reaction between phenylglyoxal and acetaldehyde. SHINTARO KODAMA. *J. Chem. Soc. Japan* 43, 691-704(1922); cf. C. A. 16, 1932.—Among the theories on the intermediate reactions in alc. fermentation, there are 2 that assume Cannizaro's reaction, which, however, has never been yet shown to occur with α -ketonealdehydes. K. demonstrates Cannizaro's reaction between BzCHO (I) and AcH . Although I is known to go over to mandelic acid in the presence of an alkali, heating its hydrate alone even at $125-30^\circ$ produces no change; when, however, its hydrate (1.1 g.) was heated with 2 cc. of pure AcH , 1.5 g. Ac_2O and a little CaCl_2 , at $95-100^\circ$, $\frac{1}{4}$ hr. in a sealed tube, it gave 3% BzCO_2H , 3% $\text{BzCH}(\text{OEt})_2$ a compd. $\text{C}_{10}\text{H}_{10}\text{O}_3$, the last being a condensation product of I and AcH . Since all the reagents were tested for the absence of alc., the reaction probably goes thus: (1) $\text{BzCH}(\text{OH})_2 + \text{AcH} = \text{BzCO}_2\text{H} + \text{EtOH}$; (2) $\text{BzCHO} + 2\text{EtOH} = \text{BzCH}(\text{OEt})_2 + \text{H}_2\text{O}$. When I is treated with EtOH , $\text{EtOCPh}(\text{OH})\text{CH}(\text{OEt})_2$ (m. $140-1^\circ$) is obtained instead of the di-Et deriv. With AcCHO , K. obtained a ketonic acid whose phenylhydrazone m. $169-70^\circ$, but glycerol could not be identified. The detailed methods of prepn. of each substance used, are given.

S. T.

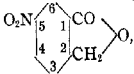
Nitration products of the methylamides of *o*- and *p*-sulfobenzoic acids. H. L. DE JONG. *Chem. Weekblad* 20, 259-60(1923).—By oxidizing *p*- $\text{MeC}_6\text{H}_4\text{SO}_2\text{Cl}$ with CrO_3 and treating the product of oxidation with MeNH_2 , is obtained the compd. *p*- $\text{HO}_2\text{CC}_6\text{H}_4\text{SO}_2\text{NMeNO}_2$, which on nitration yields *p*- $\text{HO}_2\text{CC}_6\text{H}_4\text{SO}_2\text{NMeNO}_2$. This with SO_2Cl_2 forms the compd. *p*- $\text{ClCOC}_6\text{H}_4\text{SO}_2\text{NMeNO}_2$ (I). SO_2Cl_2 and *p*- $\text{HO}_2\text{CC}_6\text{H}_4\text{SO}_2\text{Cl}$ give the compd. *p*- $\text{ClCOC}_6\text{H}_4\text{SO}_2\text{Cl}$, which with MeNH_2 and subsequent nitration yields *p*- $\text{MeNHCOC}_6\text{H}_4\text{SO}_2\text{NMeNO}_2$, the same product as is obtained from I with MeNH_2 .

R. BRUTNER

Catalysis and steric hindrance. G. VAVON AND A. HUSSON. *Compt. rend.* 176, 989-91(1923).—A study of the fixation of H_2 on compds. contg. the ethylene grouping to see if the presence of different alkyl groups near the double bond facilitates the addn. of H_2 . $\text{PhCH:CMcCO}_2\text{H}$, $\text{PhCMe:CHCO}_2\text{H}$, $\text{PhCMe:CMcCO}_2\text{H}$, their Me and Et esters and the Me, Et, iso-Pr and cyclohexyl cinnamates were studied. Polarimetric readings with α -pinene as a standard were used as a basis of measurement.

R. CHESTER ROBERTS

The opening of the lactonic ring of derivatives of phthalide by hydrazine. T. TERPENA. *Rec. trav. chim.* 42, 30-68(1923).—Earlier work on the stability of the lactonic ring is briefly reviewed. This work was undertaken to study the behavior of derivs. of phthalide, which are γ -lactones, toward N_2H_4 . Meyer (*Analyse u. Konstitutions-ermittl. organ. Verb.* 615(1909)) detd. 2 rules for the action of PhNHNH_2 and N_2H_4 on lactones as follows: (1) condensation by liberating H_2O ; (2) an opening of the lactonic ring and an addn. of the N_2H_4 with the formation of the hydrazide of the HO acid. Wedel (*Ber.* 33, 786(1900)) obtained *o*- $\text{HOCH}_2\text{C}_6\text{H}_4\text{CONHNH}_2$ (I) by the action of $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$ on phthalide in EtOH . With *p*- $\text{MeOC}_6\text{H}_4\text{CHO}$ in EtOH , I gives the *p*-methoxybenzal deriv. *o*- $\text{HOCH}_2\text{C}_6\text{H}_4\text{CONHN:CHC}_6\text{H}_4\text{OMe}$, m. 165° . In Me_2CO I gives acetone *o*-hydroxymethylbenzhydrazide, m. 148° . The MeCOPh deriv. could not be isolated. The *d*-mannose deriv. of I m. $106-9^\circ$; the *d*-galactose deriv. m. $70-5^\circ$; the *d*-glucose deriv. becomes sirupy in the air. Of these only the mannose deriv. is well crystd. With Ac_2O I gives *N*-acetyl-*o*-hydroxymethylbenzhydrazide (II), m. 146° . The presence of the Ac attached to N was proved by the fact that II did not give a benzal deriv. with BzH . With BzCl phthalide is reformed with the sepn. of N_2H_4 . Phthalide

with abs. HNO_3 gives 5-nitrophthalide (III), , m. 143° , and a mixt. of

the 3- and 5- NO_2 isomers. III in EtOH with $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$ gave 5-nitro-2-hydroxymethylbenzhydrazide (IV), m. $167-8^\circ$. IV with Me_2CO gave the acetone deriv., m. 165° ; with BzH the benzal deriv., m. 167° ; with Ac_2O the *N*-acetyl deriv., m. 171° . With $\text{Sn} + \text{HCl}$ III gave 5-aminophthalide (V), m. 178° (cf. Hoeing, *Ber.* 18, 3448(1885)). Its constitution was proved by reducing it to 5,2- $\text{H}_2\text{N}(\text{HO}_2\text{C})\text{C}_6\text{H}_4\text{Me}$ (VI). The constitution of V assigned to it by H. was proved wrong by synthesizing the 4- NH_2 isomer of VI thus: 4,2- $\text{O}_2\text{N}(\text{H}_2\text{N})\text{C}_6\text{H}_4\text{Me} \rightarrow \text{O}_2\text{N}(\text{NC})\text{C}_6\text{H}_4\text{Me} \rightarrow \text{H}_2\text{N}(\text{NC})\text{C}_6\text{H}_4\text{Me} \rightarrow \text{H}_2\text{N}(\text{HO}_2\text{C})\text{C}_6\text{H}_4\text{Me}$, the details of which are given. V with $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$ gave 5-amino-*o*-

hydroxymethylbenzhydrazide (VII), m. 147°. VII with BzH gave the benzal deriv., m. 161°; with Me₂CO the acetone deriv. m. 170°; with Ac₂O it gave 5-acetylamino-2-hydroxymethylacetylbenzhydrazide, m. 195°; V with Ac₂O + concd. H₂SO₄ gave 5-acetylaminophthalide, m. 222-3°. V diazotized and treated with CuCl₂ gave 5-chlorophthalide (VIII), m. 110°; or with CuBr₂ 5-bromophthalide (IX), m. 98°. With N₂H₄ VIII gives 5-chloro- α -hydroxymethylbenzhydrazide (X), m. 139°. X with BzH gives the benzal deriv., m. 165-6°; with Me₂CO the acetone deriv., m. 153°. IX with N₂H₄, H₂O gives 5-bromo-2-hydroxymethylbenzhydrazide, m. 152°, which with BzH gives the benzal deriv., m. 171°, and with Me₂CO the acetone deriv., m. 157°. VIII and IX with Ac₂O give the corresponding 5-chloro (or bromo)-2-hydroxymethylacetylbenzhydrazide, m. 160° and 153°, resp. α -Methylphthalide (XI) (Mermod, *Ber.* 38, 3981(1905)) was not attacked by N₂H₄, H₂O and was recovered unchanged. On nitrating XI gave 5-nitro- α -methylphthalide (XII), m. 104°, which with N₂H₄, H₂O gave 5-nitro-2-ethylolbenzhydrazide (XIII), m. 120°, and this with Me₂CO the acetone deriv., m. 120°. XIII boiled with BzH in EtOH gave XII, which shows that the lactonic ring in XII is quite stable. XIII with Ac₂O gave 5-nitro-2-ethylolacetylbenzhydrazide, m. 126°. XII with NH₄OH + H₂S gave 5-amino- α -methylphthalide (XIV), m. 126-7°. XIV boiled with N₂H₄, H₂O gives only unchanged XIV. XIV treated as with VIII gave 5-chloro- α -methylphthalide (XV), m. 45°, and 5-bromo- α -methylphthalide (XVI), m. 59°. With N₂H₄, H₂O, XV and XVI give 5-chloro (and bromo)-2-ethylolbenzhydrazide, m. 108° and 119°, resp., of which the acetone derivs. m. 119° and 135°, resp. α -Ethylphthalide (XVII) (Mermod, *l. c.*) like XI does not react with N₂H₄, H₂O. On nitration XVII gave 5-nitro- α -ethylphthalide (XVIII), m. 62°, and this on reduction gave 5-amino- α -ethylphthalide, m. 140°, and by Sandmeyer's reaction 5-chloro- α -ethylphthalide (XIX), m. 54°, and 5-bromoethylphthalide (XX), m. 63°. XVIII, XIX and XX were not acted upon by N₂H₄, H₂O, nor was α -phenylphthalide. α -Aminophthalide (XXI) was prepd. from α -bromophthalide (XXII). XXI with N₂H₄, H₂O gives 1-keto-1,2-dihydro-2,3-benzodiazine (XXIII), m. 183°, by loss of NH₃ and H₂O from the benzhydrazide formed by opening the lactonic ring. Similar treatment of XXII and of diphtalide ether gives XXIII also. Dialkylphthalides were prepd. by the method of Houben (*Ber.* 37, 489(1904); Bauer, *Ber.* 37, 735(1904)). Dimethylphthalide (XXIV) and diethylphthalide (XXV) were not acted upon by N₂H₄, H₂O. Nitration of XXIV gave 5-nitrodimethylphthalide (XXVI), m. 132°, and of XXV 5-nitrodiethylphthalide (XXVII), m. 103-4°. Neither XXVI nor XXVII is acted upon by N₂H₄, H₂O. XXVI in glacial AcOH with Fe powder gave 5-aminodimethylphthalide (XXVIII), m. 115°, which in dil. HCl with Br₂ gave 4,6-dibromo-5-aminodimethylphthalide (XXIX), m. 138°. XXVII treated similarly gave 5-aminodiethylphthalide (XXX), m. 165°, which in dil. HCl with Br gave 4,6-dibromo-5-aminodiethylphthalide (XXXI), m. 93°. XXVIII, XXIX, XXX and XXXI were not acted upon by NH₂NH₂, H₂O. Neither was diphenylphthalide. All the above work confirms and extends Hjelt's rule (*Ber.* 24, 1237, 1239(1891)): all circumstances that favor ring closure increase the stability of lactones. The introduction of one Me, Et or Ph group in the CH₂ group of phthalide is enough to prevent the opening of the ring with N₂H₄. The heavier the hydrocarbon group the greater the stability. When Cl, Br or NO₂ is introduced in position 5 in XI the lactone ring products are opened by N₂H₄, but this is not true of XVII. The introduction of Me₂, Et₂ or Ph₂ in phthalide gives products that do not react with N₂H₄ even when substituted with Cl, Br or NO₂. E. J. WITZEMANN

Ozonization of naphthalene. L. SEEKLES. *Chem. Weekblad* 20, 261(1923).—10% C₁₀H₇(CHO)₂ (I) and 90% *o*-HO₂CC₆H₄CHO (II) are obtained by ozonization of C₁₀H₈. From I and *p*-O₂N-C₆H₄NHNH₂ were obtained 2 isomeric di-*p*-nitrophenylhydrazones, m. 244° and 208°, resp. II presents a case of tautomerism: II \rightleftharpoons C₆H₄.CH(OH).O.CO; refractometric methods showed that in abs. alc. the second form is the stable one.

Removal of carboxyl groups from organic acids. F. FISCHER AND H. SCHRADER. *Ges. Abhandl. Kennt. Kohle* 5, 307-10(1921).—3.3 g. of phthalic acid, when heated for 3 hrs. at 400° in excess of soda soln., yielded 0.7 cc. of C₆H₆, 0.44 g. of BzOH, and traces of C₆H₄(CO)₂O. The loss is ascribed to volatilization of C₆H₆. J. S. C. I.

Action of hypochlorous acid on bornylene. G. G. HENDERSON AND J. A. MAIR. *J. Chem. Soc.* 123, 1155-61(1923).—A comparison is made between the action of HOCl upon camphene (*C. A.* 8, 2682) with that on bornylene. In the former case the only product isolated was the chlorohydrin, in the latter at least 3 compds. result. Bornylene in a little petrol. ether was repeatedly shaken with a dil. aq. HOCl, the product dried and distd. Bornylene chlorohydrin (I) was finally obtained by crystg. from a satd. MeOH soln. at 0°; it m. 99-101°, and has an odor of borncol. *p*-Nitrobenzoate, m.

152°. A 10% soln. of I in MeOH heated with Zn dust gave borneol, indicating that I is a chloroborneol. I with Cr_2O_3 gave a *chloroketone*, $\text{C}_{10}\text{H}_{18}\text{OCl}$, m. 131–2°, the semicarbazone of which m. 223°; it is probably identical with that obtained from camphene chlorohydrin (β -chlorocamphor). KOH and I gave a *glycol*, $\text{C}_{10}\text{H}_{18}(\text{OH})_2$, the *di-p-nitrobenzoate* of which m. 103–5°; this is also obtained by the action of Ag_2O . The mother liquor of I was treated with $p\text{-O}_2\text{NC}_6\text{H}_4\text{COCl}$ and the filtrate neutralized and distd. with steam. A *chlorocamphane*, m. 71–3°, was isolated, which was reduced by Zn to camphane. The more sol. portion showed the probable presence of a dichlorocamphane.

C. J. WEST

Pinocamphane. S. NAMETKIN AND ANNA JARZEV. *Ber.* 56B, 832–3(1923).—By hydrogenation of *l*-rotatory α -pinene, $[\alpha]_D -42.38^\circ$, by Sabatier's method at 155–8°, N. obtained a dihydropinene, pinane, $b_{748} 168.5-9.0^\circ$, $d_4^{20} 0.8390$, $n_{20} 1.4540$, $[\alpha]_D -1.25^\circ$ (*J. Russ. Phys. Chem. Soc.* 51, 147(1920)), but as these results differed from those of other investigators it was attempted to prep. the substance by catalytic decompn. of the *hydrazone* (I) of pinocamphone (II) which, according to Wallach, contains the same bicyclic system as pinene, but an entirely new hydrocarbon, designated *pinocamphane* (III), was obtained. I, from II and $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$ heated 5 hrs. in sealed tubes at 190–200°, is an oil of penetrating odor, $b_{22} 134-5^\circ$, $d_4^{20} 0.9917$, $n_{20} 1.5153$; 8.5 g. heated in a Ag flask with 2 g. KOH and a few pieces of platinumized clay gave 3.5 g. III, $b_{703} 164.5-5.0^\circ$, $d_4^{20} 0.8551$, $n_{20} 1.4609$; it was also obtained in 4 g. yield from 7 g. I with NaOEt in a sealed tube at 170–80°.

C. A. R.

Attempted synthesis of norpinic acid. K. L. GANGULY. *J. Indian Inst. Sci.* 5, 23–8(1922).—The structure of norpinic acid is of importance because of its relation to pinene and its products. Various attempts were made to condense $\text{Me}_2\text{C}(\text{CHBr})\text{CO}_2\text{Et}$ and CH_2Br_2 or CH_2I_2 by means of Na; a fraction was obtained having the same b. p. as Et norpinate which, upon hydrolysis, gave an acid, m. 172° (that of norpinic acid); the amt. was too small for analysis and thus the question of synthesis could not be decided.

C. J. WEST

Isocampholic acid. H. RUPE AND P. BRIELLMANN. *Helvetica Chim. Acta* 5, 767–77(1922).—Isocampholic acid (I) was considered by Guerbet (*Bull. soc. chim.* [3] 11, 491) as an isomer of campholic acid (II) and by Mahla and Tiemann (*Ber.* 33, 1929) as a dihydropinophenolic acid. Recent work of Lipp (*C. A.* 17, 92) prompts publication of the incomplete study of the constitution of I. I is best purified by taking advantage of the slow rate of esterification of II; final purification was through the *chloride*, $b_{11} 103^\circ$ (94% yield), and *amide*, $b_{14} 192-3^\circ$, m. 112°, and *sapon*, to I, $b_1 141^\circ$, $d_4^{20} 0.9789$; $[\alpha]_D$: C, 24.40; D, 30.36; Hg, 35.70; F, 45.64. In C_6H_6 (d. 0.8893), $[\alpha]_D$: C, 20.69; D, 26.26; Hg, 30.70; F, 40.25. Et ester, $b_{12} 103^\circ$, $d_4^{20} 0.9426$; $[\alpha]_D$: C, 21.23; D, 26.64; Hg, 31.20; F, 40.28. *Anilide*, $b_{10} 188^\circ$, m. 119.5° (yield, 91%). *p*-*Toluidide*, m. 133–4°. I may be obtained in 6% yield from II by heating with KOH at 280° for 30 hrs. Oxidation of I with concd. HNO_3 gives 21% camphoric acid. Et bromoisocampholate, $b_8 125.5^\circ$ (96% yield), was prepd. in order that HBr might be split off by MeOH-KOH and thus give an unsatd. acid, analyzed as the Ag salt, $\text{C}_{10}\text{H}_{15}\text{O}_2\text{Ag}$; the acid $b_8 146-7^\circ$, has $d_4^{20} 1.0374$, $[\alpha]_D 15.88^\circ$. Action of O_3 gave an acid, the Ca salt of which analyzed for $\text{C}_{10}\text{H}_{14}\text{O}_3\text{Ca} \cdot 2\text{H}_2\text{O}$. Further investigation is necessary to establish the formula of I.

C. J. WEST

Reduction products of hydroxymethylenecamphor. V. Addition of hydroxylamine to methylenecamphor. H. RUPE AND H. SCHMIDT. *Helvetica Chim. Acta* 5, 778–85(1922); cf. *C. A.* 15, 367.— NH_2OH reacts with methylenecamphor to form *di[methylenecamphor]hydroxylamine*, $\text{C}_{22}\text{H}_{35}\text{O}_2\text{N}$ (I), sinters 104° , m. $109.5-10.5^\circ$; *HCl salt*, readily decompd. by boiling H_2O ; *oxalate*, m. $169-9.5^\circ$. Reduction with SnCl_2 and HCl gives dicamphomethylamine (*C. A.* 15, 367). Oxidation of I with FeCl_3 in EtOH gives the *compd.* $\text{C}_{21}\text{H}_{31}\text{O}_2\text{N}$, turns yellow 195° , m. $208-10^\circ$, the mol. wt. of which is 2–4 times the simple formula. I reacts with SOCl_2 to form the *N-chloride*, turns yellow 135° , m. $202-5^\circ$ (decompn.). From the mother liquor of I a small amt. of a base was isolated as the *oxalate*, m. $158-9^\circ$, which may be the acid salt of *camphomethylhydroxylamine*.

C. J. WEST

The betulins. OTTO DISCHENDORFER. *Ber.* 55B, 3692–3(1922).—From the analysis of several *monobromobetulin diacetates* (I), m. 193° , D. concludes betulin has a formula of $\text{C}_{30}\text{H}_{48}\text{O}_2$ or $\text{C}_{30}\text{H}_{46}\text{O}_2$. *Monobromobetulins*, m. 215° , give I on acetylation.

R. CHESTER ROBERTS

The cryoscopy of diphenyl in acetic acid. A. BERLANDE. *Bull. soc. chim.* 33, 466–8(1923).—The mol. wt. of Ph_2 is calcd. from the f. p. of its solns. in AcOH. The

mol. wt. found is higher than the theoretical for the more concd. and lower than the theoretical for the very dil. solns. It is thought that the deviation in the case of the very dil. soln. was caused by the absorption of water vapor by the AcOH. J. A. A.

Diphenyl derivatives. III. Derivatives of bromodiphenyl. A. GARCÍA BANÚS AND L. MEDRANO. *Anales soc. españ. fis. quim.* **20**, 475-8(1922); cf. C. A. **16**, 2135.—Twenty g. of 4-BrC₆H₄Ph stirred 1.5 hrs. at 70-80° with 45 g. HNO₃ (40° Bé.) and 20 g. H₂SO₄ gave 5 g. 4-bromo-2'-nitrodiphenyl, m. 65-8°, sol. in alc. and 11 g. 4-bromo-4'-nitrodiphenyl (I), m. 173°, insol. in alc. I was not reduced by Fe and AcOH. With Sn and AcOH-HCl a good yield of 4-bromo-4'-aminodiphenyl (II), m. 139-40°, was obtained. II could not be methylated with Me₂SO₄. Heated in a sealed tube 10 hrs. at 140-50° with MeOH and strong HCl, 4-bromo-4'-dimethylaminodiphenyl (III), m. 180-5°, was obtained. The mother liquor from the crystals yielded the corresponding methochloride, m. 180-5°. III does not form a Grignard reagent. Treated with dil. HNO₃ III forms 4-bromo-2-nitro-4'-dimethylaminodiphenyl, orange, m. 107°.

IV. Derivatives of aminodiphenyl. A. GARCÍA BANÚS AND J. GUITERAS. *Ibid* 479-85.—By boiling an alc. soln. of 2,4-(O₂N)₂C₆H₃Cl with *p*-H₂NC₆H₄Ph and fused NaOAc, a dinitroanilindiphenyl (I), PhC₆H₄NHC₆H₃(NO₂)₂, was obtained, m. 147°, crystallizes in two forms, orange needles from AcOH and red crystals from PhMe. The transformation point from orange to red is 95-105°. By reduction with Na₂S *p*-nitro-*o*-aminoanilindiphenyl, m. 188°, is obtained. The orange isomer of I prepd. in like manner from *o*-H₂NC₆H₄Ph, m. 159°. The corresponding dark orange 2-*p*-nitro-*o*-aminoanilindiphenyl, obtained by reduction with Na₂S, m. 151-2°. 4'-Bromo-4-*o*,*p*-dinitroanilindiphenyl from 4,4'-bromoaminodiphenyl, yellow, m. 204-5°. 3,4-(H₂N)₂C₆H₃Ph gives with HCl and NaNO₂, 5-phenylbenzimidazole, PhC₆H₄NH.N.N.

m. 154-5°. 4'-Amino-4-*o*,*p*-dinitroanilindiphenyl, m. 245-7°. 4'-Amino-4-*p*-nitro-*o*-aminoanilindiphenyl, by reduction of the preceding compd. with Na₂S, red, m. 201°. By further reduction with SnCl₃, 4'-amino-4-*o*,*p*-diaminoanilindiphenyl, gray, m. 197°, was obtained. **V. Nitrohydroxydiphenyls.** A. GARCÍA BANÚS AND J. GUITERAS. *Ibid* 21, 126-31(1922).—HO(O₂N)₂C₆H₃Ph could not be prepd. by the ordinary methods of nitration. 3,5-Dinitro-4-hydroxydiphenyl (I), readily prepd. from HOC₆H₄Ph (II) and HNO₃ (d. 1.52) dild. with an equal vol. of AcOH, yellow, m. 154-5°. With alkalis it forms intensely red salts slightly sol. in cold H₂O. I is readily reduced to 4,3,6-HO(H₂N)₃C₆H₃Ph by Sn and HCl. By nitration of II at 50-60° with fuming HNO₃, 3,5,4'-trinitro-4-hydroxydiphenyl, yellow, m. 201-2°, was obtained.

L. E. GILSON

Molecular configuration of polynuclear aromatic compounds. III. Diphenyl-3,5,3',5'-tetracarboxylic acid. HAROLD BURTON AND JAMES KENNER. *J. Chem. Soc.* **123**, 1043-5(1923); cf. Christie and K., C. A. **17**, 2282.—*Me* *m*-iodoisophthalate, m. 104-5°; *Et* ester, m. 76°. Diphenyl-3,5,3',5'-tetracarboxylic acid, m. above 300°; *Me* ester, m. 209°; *Et* ester, m. 146-7°; chloride, m. 128°; amide, m. above 300°; anilide, blackens without m. at 280°. The acid is recovered unchanged after boiling 10 hrs. with Ac₂O (no anhydride formation). The failure to obtain an anhydride of this acid is not such decisive evidence against the Kauffler formula as it would at 1st sight appear to be, because the 2,6,2',6'-acid likewise does not yield an anhydride, although a chloride is readily obtained. C. J. WEST

Crystallographic examination of several organic compounds. P. J. BRÜGER. *Z. Krist.* **57**, 303-7(1922).—Prepn. and crystallographic data for *p*-aminobenzophenone-*p*'-sulfonic acid (I), its Ba salt (II), *sym-p,p'*-dinitrotetraphenylethane (III) and *sym-p,p'*-diaminotetraphenylethane (IV) are presented. The results were: I, diamond-shaped colorless, monoclinic symmetry, *a*:*b* = 2.530:1, β = 96°5' to 100°; refractive indexes n_γ = 1.74, n_β ~ (<) 1.74, n_α ~ (>) 1.54; axial planes 11 (010); II, monoclinic, β 96.5°; n_α = 1.523, n_γ = 1.74; in direct light, the crystals have a yellow, in transmitted light a yellowish green color; III m. 262-3°, monoclinic prismatic, yellow, *a*:*b*:*c* = 1.43:1:0.87, β = 112°34', cleavage not perceptible. IV m. 215°, minute monoclinic prismatic crystals, *a*:*b* = 0.520:1, β = 107°. PAUL BOONE

Ethers of triphenylcarbinol. BURCKHARDT HELFERICH, P. E. SPEIDEL AND WALTER TOEDTKE. *Ber.* **56B**, 766-70(1923).—An alc. in C₆H₅N treated with the calcd. amt. of Ph₃CCl gives the Ph₃C ether, and as the reaction takes place in an excess of C₆H₅N it can be employed with substances sensitive to acids (especially glucosides, di- and polysaccharides). These ethers, as far as they have been studied, are stable towards alkalis, even in boiling alc., while they are converted by very dil. HCl in MeOH at room temp. into the original alc. and Ph₃COMe. The following triphenylmethyl ethers are described: *Iso-Pr*, (3.5 g. from 7.5 g. of the alc. and 10 g. Ph₃CCl in 25 cc. C₆H₅N after 20 hrs. at

room temp.), m. 113°; *Pr* (yield, about 0.5 of the alc.), m. 55°; *cetyl* (2 g. from 1.74 g. of the alc.), m. 40–1°; *allyl*, m. 76°; *cyclohexyl*, m. 103°; *glycol mono-ether*, $\text{HOCH}_2\text{CH}_2\text{OCPh}_3$, from 6 g. of glycol and 13.8 g. Ph_3CCl in 30 cc. $\text{C}_6\text{H}_5\text{N}$ heated 0.5 hr. on the H_2O bath, m. 98–100°; *glycol bis-ether*, from 0.5 g. glycol and 4.6 g. Ph_3CCl in 6 cc. $\text{C}_6\text{H}_5\text{N}$ after 16 hrs. at room temp., m. 185–6°; *glycerol α -mono-ether*, (3 g. from 8 g. glycerol and 12 g. Ph_3CCl), m. 92–4°; *glycerol α,α' (?)bis-ether*, from 1 g. glycerol and 7 g. Ph_3CCl after 0.5 hr. on the H_2O bath, m. 170–1°; *pyrocatechol bis-ether* (3.5 g. from 1 g. $\text{C}_6\text{H}_4(\text{OH})_2$ and 5 g. Ph_3CCl after 1 hr. on the H_2O bath), m. 206–8°; *pyrocatechol monophenylmethyl compd.* (?), from 4 g. $\text{C}_6\text{H}_4(\text{OH})_2$ and 5 g. Ph_3CCl after 1 hr. on the H_2O bath, darkens about 245°, m. around 258°, is, unlike all the other ethers above, stable towards 1% HCl in MeOH after 1 hr. of boiling and towards 10% HCl in MeOH at room temp., and is therefore probably not the ether $\text{HOC}_6\text{H}_4\text{OCPh}_3$. C. A. R.

Dyes of the aurin type. I. HARRY BAINES AND J. E. DRIVER. *J. Chem. Soc.* 123, 1214–8 (1923).—In an attempt to elucidate the mechanism of the Reimer-Tiemann reaction, dry Na phenoxides were subjected to the action of CCl_4 . The velocity of the reaction was found to depend largely on the temp., and, in the case of PhOH , on the nature of the metallic deriv. employed. PhOK , heated at 170° in a stream of CCl_4 vapor, gave a 75% yield of aurin. In an attempt to decrease the amt. of free PhOH formed, a mol. mixt. of KOH and PhOK was used but only a trace of aurin resulted. The comparative yields from K, Na and Ca phenoxide were: 40, 9 and 3. 3,3',3''-Trimethylaurin, from $o\text{-MeC}_6\text{H}_4\text{OK}$ and CCl_4 , brick-red powder. 2,2',2''-Trimethylaurin, red. Boiled with PhNH_2 and glacial AcOH for 48 hrs., N,N',N'' -triphenyl-2,2',2''-trimethylparosaniline results as dark blue crystals. CCl_4 reacts with $p\text{-MeC}_6\text{H}_4\text{OK}$ to give a light gray amorphous powder, which is being investigated. A similar product appears to be formed by the action of $p\text{-MeC}_6\text{H}_4\text{OH}$, HCO_2H and ZnCl_2 . C. J. WEST

Sodium salts of phenolphthalein. HENRY BASSETT AND PHILIP HALTON. *J. Chem. Soc.* 123, 1291–304 (1923).—This is a phase-rule study of the system phenolphthalein- NaOH at 25°, which is a 3-component one. The most striking result is that a red Na salt is apparently incapable of existing as a solid phase in contact with soln. at this temp. All the salts obtained are colorless. They are (a) 2 mono-Na salts with 4 and 8 mols. of H_2O of crystn.; (b) 3 di-Na salts, of which 1 is anhyd., and the other 2 contain 4 and 8 mols. of H_2O ; (c) 4 tri-Na salts with 6, 12, 13, and 14 mols. of H_2O . All the tri-Na salts are stable over definite ranges of concn. at 25° but of the di-Na compds. only the octahydrate is stable and only the tetrahydrate of the mono-Na salts is stable. The nature of the solid salts and of the solns. is discussed. None of the facts observed is opposed to the theory of benzenoid-quinonoid tautomerism of phenolphthalein derivs. C. J. WEST

Röntgen spectroscopic investigation of organic compounds. KARL BECKER AND HERTA ROSE. *Z. Physik* 14, 369–73 (1923); cf. Becker and Jancke, *C. A.* 16, 872.—Data are given for $(\text{PhCH}_2)_2$, PhCH:CHPh , Bz_2 , Ph_3CH , Ph_3COH , mannitol and sucrose. C. J. WEST

The ethylene chromophore. H. LEY AND F. RINKE. *Ber.* 56B, 771–6 (1923); cf. *C. A.* 15, 2428.—Introduction of a Me group into the α -position in PhCH:CHPh (I) produces a decrease of the selective absorption and the original continuous absorption is shifted towards the shorter wave lengths. Introduction of a 2nd Me group so increases this effect that in PhCMe:CMepH (II) there remains only an indication of selective absorption and the absorption of the thicker layers is shifted towards the shorter wave lengths. A Me group in the nucleus has a quite different optical effect; in $p\text{-MeC}_6\text{H}_4\text{CH:CHPh}$ (III) the curve is markedly shifted towards the longer wave lengths. Below are the vibration frequencies of 4 derivs. of I in 0.01 mol. alc. soln. in layers 10, 4, 2 and 1 mm. thick, resp.: I, 2980, 3000, 3020, 3035; PhCMe:CHPh , 3065, 3100, 3115, 3150; II, 3100, 3210, 3340, 3540; III, —, 2900, 2945, 2960. PhCH:MeCHMePh (IV), the satd. analog of III, absorbs considerably less and is similar to $\text{PhCH}_2\text{CH}_2\text{Ph}$ and $\text{PhCMe(OH)CMe(OH)Ph}$ (V); the frequencies for 5, 3 and 1 mm. layers of 0.01 mol. alc. solns. are: IV, 3655, 3680, 3701; V, 3670, 3690, 3721. The spectral similarity between I and $\text{PhCH:CHCO}_2\text{H}$ is strikingly shown by the completely analogous hypsochromic influence of Me groups in the 2 series. Cl in the α -position in PhCH:CH_2 (VI) has a weak hypsochromic effect and in the β -position it shifts the absorption towards the longer wave lengths; the curves of the Me, and alkoxy Cl derivs. of VI show a striking similarity. The curve for PhCCl:CHPh resembles that of I itself except that the band is less deep and shifted about 30 units towards the ultraviolet, while Cl in the p -position of the nucleus has a distinct bathochromic effect, the curve for III, as compared with that of I, being shifted towards the longer wave lengths

with hardly any change in the depth of the band. In the series $I \rightarrow PhCPh:CHPh \rightarrow PhCPh:CPh_2$, in the thicker layers and at the higher concns. the absorption is progressively shifted towards the red and in the region of least transparency (3200–3600) the absorption decreases; the extinction coeffs. decrease with increase in the no. of Ph groups and the head of the band is simultaneously shifted slightly towards the longer wave lengths. Just as the α -Cl, α -Me and α -alkoxy derivs. of VI show very similar absorptions, so their refractometric consts. differ but slightly; in the β -series, the relationship is not so simple. The complex formed by II with *sym*- $C_6H_5(NO_2)_3$ in $CHCl_3$ is markedly less highly colored than that formed by $PhCMe:CHPh$ and so also in the Ph derivs. of I the color of the complexes decreases considerably with increasing no. of Ph groups.

C. A. R.

Constitution determinations by the spectroscopic method: so-called triphenylvinyl alcohol. Enol salts. H. LAY AND W. MANECKE. *Ber.* 56B, 777–83(1923).—As recently found by Meyer and Gottlieb-Billroth by chem. means (*C. A.* 15, 2639), so L. and M. now show by optical methods that the so-called "triphenylvinyl alc." (I) cannot be an enol and is the ketone $PhCOCHPh_2$ (II). $Ph_3C:CPhOAc$ (III), in which the enol form is fixed, has an absorption very similar to that of $Ph_3C:CHPh$ (IV); within a very wide concn. range (5 mm. of 0.1 mol. to 5 mm. of 0.001 mol. soln.) the absorption of both compds. is continuous; between 2.5 and 1 mm. of 0.001 mol. soln. band absorption (less pronounced with III than with IV) appears. The absorption of I, on the other hand, has no similarity to that of III but greatly resembles that of $PhCOMe$, $PhCOCH_2Ph$ and $PhCOCPh_2$ (V). That I is not a $PhCH:CHPh$ deriv. is further indicated by the fact that while the complexes with *sym*- $C_6H_5(NO_2)_3$ formed in $CHCl_3$ by IV and III are yellow and faint yellow, resp., those formed by I and V are colorless. 9-Benzofluorene, $(C_6H_4)_2C:CHPh$, shows an absorption very similar to that of IV and forms an intensely yellow complex with $C_6H_5(NO_2)_3$. The optical similarity of $(C_6H_4)_2CH:COPh$ (VI) to II is at first glance not so obvious, owing to the presence in VI of the fluorene ring, which materially increases the absorption. Even very dil. alc. solns. of VI are colored intensely yellow by $NaOEt$ (also by aq. NH_4OH); the spectra of 0.005 mol. alc. solns. contg. 1 and 4 mols. $NaOEt$, resp., are practically identical so that there can be no considerable alcoholysis in the solns., i. e., the enol $(C_6H_4)_2C:C(OH)Ph$ (VII) has a relatively strongly pronounced acid character, which is remarkable in view of the fact that it has no C:O groups which can take part in the salt formation. By means of an app. in which it was possible to measure the absorption within 3 sec. after mixing the Na salt of VI with acid, the curve for the free VI was established, at least approximately. The initial absorption in the thicker layers does not differ materially from that of $(C_6H_4)_2C:CHPh$. With this app. it is also possible to follow the conversion of VII into VI.

C. A. R.

***o*-Quinones and 1,2-diketones. VI. Pseudobenzils. II. Benzils of the superoxide form:** *o,o*-diethoxybenzil, a benzil derivative colorless in solution. A. SCHÖNBERG AND W. MALCHOW. *Ber.* 55B, 3746–52(1922); cf. *C. A.* 16, 3648.—The previously investigated pseudobenzils give yellow solns. of varying intensities, in which it has been assumed that there is an equil. between the keto-form of the benzil, $ArCOCOAr$, and the superoxide form which favors the former more in the case of the intensive than in the pale yellow forms. This was supported by the fact that the deeper the color of the soln. the more readily reaction occurred with 1,2-diketone reagents. This receives further support in the prepn. of a benzil which gives a colorless soln. and its very inactive. 2,2'-Diethoxybenzil, m. 157°, results by the interaction of *o*- HOC_6H_4CHO and $EtBr$ in alc. K_2CO_3 for 8 hrs., then adding H_2O to the filtered soln. until 70% $EtOH$ results and heating with KCN for 4 hrs., and finally oxidizing with Fehling soln. (yield 10 g. from 25 g. HOC_6H_4CHO). The H_2SO_4 reaction is yellow-red. Upon melting, it is deep yellow but solidifies to colorless crystals. It is stable towards concd. aq. NH_4OH in a sealed tube, does not react with H_2O_2 at 100° and reacts with 1,2- $C_{10}H_8(NH_2)_2$ only by heating in $PhNMe_3$, giving 2,3-bis-[*o*-ethoxyphenyl]- α,β -naphthoquinoxaline, m. 180° and giving a bluish violet color with H_2SO_4 . The analogous *o*-methoxy deriv. m. 180° and gives a violet color with H_2SO_4 . 2,3-Bis-[*o*-methoxyphenyl]-6-methylquinoxaline, m. 135°; the concd. H_2SO_4 soln. is deep red. 2,3-Bis-[*o*-methoxyphenyl]-quinoxaline, m. 183°; the concd. H_2SO_4 soln. is red. Reduction of (*o*- $MeOC_6H_4CO$) $_2$ with $Zn-Hg$ in concd. HCl gives $(MeOC_6H_4CH_2)_2$, m. 86°. $PhMgBr$ reacts with (*p*- $EtOC_6H_4CO$) $_2$ to give α -phenyl-4,4'-diethoxybenzoin, $EtOC_6H_4CPh(OH)COC_6H_4OEt$, m. 111° and giving a red soln. in concd. H_2SO_4 . 3,3'-Dimethoxybenzoin, m. 55°, from *m*- $MeOC_6H_4CHO$ and KCN in 66% $EtOH$. 3,3'-Dimethoxybenzil, yellow, m. 88°. 2,3-Bis-[*m*-methoxyphenyl]-quinoxaline, m. 110°, and gives a red-brown soln. in concd. H_2SO_4 . VII. Pseudobenzils. III. The separation of a 1,2-diketone into its colored

(crystallized) ketone form and its colorless (crystallized) superoxide form. A. SCHÖNBERG AND W. BLEYBERG. *Ibid.* 3753-8.—(p -HOC₆H₄CO)₂ in the calcd. amt. of EtOK reacts with PhCH₂Br to give the *dibenzyl ether* (I), deep yellow, m. 126°. By working with small amts. (0.02 to 0.2 g.) in concd. soln. and quickly cooling it is possible to obtain the superoxide-form as colorless crystals, which must be removed from the mother-liquor very quickly since transformation to the colored form is accelerated by the solvent. This form dissolves in concd. H₂SO₄ with a reddish yellow color and in the ordinary solvents with a yellow color. When allowed to cryst. in the usual way, the yellow form is always obtained. Since a colorless soln. is not first formed when the colorless form is dissolved, it is probable that the transformation of the superoxide form to the ketone form proceeds very rapidly. H₂O₂ with I gives PhCH₂OC₆H₄CO₂H. 1,2-C₁₀H₆(NH₂)₂ gives 2,3-bis-[p -benzyloxyphenyl]- α,β -naphthoquinoxaline, m. 156° and giving a blue-violet color with concd. H₂SO₄. C. J. WEST

Catalytic action. I. Catalytic reduction of α -naphthol and α -naphthylamine. SHIGERU KOMATSU AND RYUZABURO NODZU. *Mem. Coll. Sci. Kyoto Imp. Univ.* 6, No. 4, 177-81 (1923).—From a study of the reduction products of α -C₁₀H₇OH it is concluded that reduction with H in the presence of reduced Ni at 100-110° gives 41% crude α -C₁₀H₁₂O and 51% α -C₁₀H₁₂O, while at 135-40° the ratio is 10 and 90%. This is based upon the amt. of α -tetrahydronaphthalene and C₁₀H₁₂ isolated. In the reduction of α -C₁₀H₇NH₂ at 135-45°, the products are 90% α -C₁₀H₁₁NH₂ and 10% α -deriv. **II. Catalytic preparation of p -cymene and its formation in sulfite turpentine.** SHIGERU KOMATSU, HISAHU NAKAMURA AND MASAO KURATA. *Ibid.* 183-6.—Pinene or menthene, heated with about 0.5 its wt. of S at 200° for 23 hrs. gave about 50% crude p -cymene. Menthol and borneol do not react in this manner, but terpenes of the formula C₁₀H₁₆ can easily be transformed into cymene. The fact that sulfite turpentine consists of about 50% p -cymene is accounted for on the basis that the terpene existing in the wood is transformed during the manu. of the pulp by the sulfite process, into p -cymene by catalytic oxidation with S which is liberated in a free state in the digester. Also in *Chem. News* 127, 2-4 (1923). C. J. WEST

A new class of derivatives of β -naphthol, the 1-arylamino-2-hydroxynaphthalenes. A. WAHL AND ROBERT LANTZ. *Bull. soc. chim.* 33, 93-110; *Compt. rend.* 175, 171-4 (1922); *Rev. gen. mat. color.* 28, 33-41 (1923).—2- p -Nitrodiazobenzeneoxidenaphthalene-1-sulfonic acid was isolated as an intermediate compd. in the coupling of Tobias' acid and p -ON₂C₆H₄N₂Cl to form p -nitroaniline red (I). Kekulé had previously conjectured the existence of this compd. It is hydrolyzed by warm dil. acids to I, the reaction being accompanied by a splitting off of the SO₃H group and a mol. rearrangement. A general method for the prepn. of diazo oxides is given. 1-Arylamino-2-hydroxynaphthalenes are produced by merely heating primary aromatic amines with the α -halogen- β -naphthols, the degree of completeness of the reaction being measured by the HX evolved. They are well crystd. solids, colorless when pure, but darkening in the air, insol. in water and acids, sol. in alkalis, m. sharply and distil *in vacuo* at high temps. The following were prepd.: *phenyl*, m. 155-6°, b₁₅₋₂₀ 270°, (Me ether, m. 82-3°); *p*-tolyl, m. 138-9° (Me ether, m. 94°); *o*-tolyl, m. 114-5°; *o*-methoxyphenyl, gray, m. 110°; *o*-methoxy-*m*-tolyl, light green, m. 118°; α -naphthyl, gray, m. 171°; β -naphthyl, gray, m. 166-7°. JAMES A. BRADLEY

β -Naphthoquinone- β -diazide. E. BAMBERGER, O. BÖCKING AND E. KRAUS. *J. prakt. Chem.* 105, 251-65 (1923).— β -Naphthoquinone- β -diazide (I), C₁₀H₆N₂O, pale yellow, m. 76°, results from β -C₁₀H₇N₂OH and K₃Fe(CN)₆ at 0°. Both the solid form and solns. are sensitive to light, the solid changing in 10 min. to a Cu-red compd., with a much lower m. p. Fuming HCl gives a golden yellow soln. from which H₂O ppts. I unchanged. HCl gas ppts. the *HCl salt*, egg-yellow, from I in Et₂O; 15% of the HCl is lost after 2 hrs. over KOH. I with SnCl₄ and HCl gives 2-H₂NC₁₀H₄OH and α -C₁₀H₇OH. Very small amts. of I may be obtained from NaNO₂ and 2-H₂NC₁₀H₄OH. P₂S₅ with I at 70° gives naphthylenediazosulfide (Jacobson, *Ann.* 277, 260). Heated with concd. aq. K₂SO₃ until soln. results, *K 1-naphthol-2-diazosulfonate*, orange-yellow, results, which is reduced to 2-H₂NC₁₀H₄OH. 1,4-C₁₀H₆(OH)₂ is formed by heating I with H₂SO₄ (1:2). A repetition of Böhmer's work (*J. prakt. Chem.* 24, 449) on dibromoquinonediazide showed that only one compd. is produced by the 2 reactions described by B., and that the product decomp. 145-54°. B. described 2 compds., one decomp. 137°, the 2nd at 145°. C. J. WEST

β -Naphthoquinone- α -diazide. E. BAMBERGER, MARIE BAUM AND LEO SCHLEIN. *J. prakt. Chem.* 105, 266-82 (1923).— β -Naphthoquinone- α -diazide (I), yellow rhombic prisms, m. 94.5-95°, results in 10-4% yield from α -C₁₀H₇N₂OH and K₂Fe(CN)₆. A by-product is C₁₀H₇NHNO₂. I is also obtained in very small amts. from NaNO₂ and

1-H₂NC₁₀H₆OH. In chem. behavior it resembles the β -diazide. Reduction gives 1-H₂NC₁₀H₆OH. H₂SO₄ gives *naphtho-1,2-hydroquinone* (II), orange-yellow, m. 102.5° (Liebermann and Jacobson, *Ann.* 211, 58, give about 80°), and β -dinaphthylidihydroquinone, identified as the Ac₂ deriv. Repetition of L. and J.'s expt. proved the identity of their compd. with II. P₂S₅ gives 1,2-naphthylenedisulfide, m. 68.5°. When either the α - or β -diazide is heated with PhMe for 3-4 hrs., N is evolved and *bisnaphthalene oxide*, C₁₀H₄:O₂:C₁₀H₄, m. 256°, results.

C. J. WERT

β -Naphthoquinone- α -diazide and potash in methanol. F. BAMBERGER AND S. WILDI. *J. prakt. Chem.* 105, 278-82 (1923).—10% MeOH-KOH and the α -diazide at 100° give (HOC₁₀H₇)₂. β -C₁₀H₇OH, and *naphthohydroquinone Me ether*, HOC₁₀H₆OMe, m. 90.5-91°, the constitution of which was established by synthesis from 1,2-O₂NC₁₀H₆OH.

C. J. WERT

Synthesis of 4-hydroxy-1,2-dimethylantraquinone. ARTHUR FAIRBOURN AND J. M. GAUNTLETT. *J. Chem. Soc.* 123, 1137-9 (1923).—*o-2-Hydroxy-4,5-dimethylbenzoylbenzoic acid*, m. 175°, by heating equal amts. of H₃BO₃, phthalic acid and *o-4*-xylenol at 160° for 4 hrs., and extg. the acid from the steam-distd. residue with Ca(OH)₂. Dehydration of the acid gives 4-hydroxy-1,2-dimethylantraquinone, golden yellow, m. 169°.

C. J. WERT

Furylthyamine. YASUHIKO ASAHINA AND ATSUSI FUJITA. *J. Pharm. Soc. Japan* No. 490, 1084-90 (1922).—The general method of Claisen (*Ber.* 38, 702), who condensed BzH and ClCH₂CO₂Et in the presence of Na to phenylglycidic acid ester, was applied to the prepn. of furylthyamine. To 12 g. of furfural and 15.3 g. of ClCH₂CO₂Et in cold Et₂O 3.5 g. of Na wire was added. A few hrs. after adding a few drops of alc., the reaction is complete. Since the resulting furylglycidic ester is unstable, it is sapon. without further purification by adding it to NaOEt to which enough H₂O had been added to make NaOH. If NaOEt alone is used the Na salt will not ppt. out. To this Na salt, a little excess of NH₄OH. HCl is added. Two phenylacetaldoximes are produced—an unstable oily substance, which is apparently the *anti*-form and which goes over to the more stable *syn*-form, m. 64°; both are intensely sweet, the former being 50 times as sweet as cane sugar, while the latter is 1/2 as sweet as the *anti*-form. The oximes are reduced to furylthyamine by 3% Na-Hg mixt. and 50% AcOH. The amine b₇₆ 155°, has d₄²⁰ 1.0080, n_D²⁰ 1.47994, and takes up atm. CO₂, going over to the carbamate, m. 87°.

S. T.

Constitution of elsholtzic acid. Y. ASAHINA AND S. KUWADA. *J. Pharm. Soc. Japan* No. 485, 565-79 (1922).—A. and Kariyone suggested before (*C. A.* 12, 1047) that elsholtzic acid (I) obtained from elsholtzic ketone is probably 3-methylfuran-2-carboxylic acid. In order to test out the correctness of this hypothesis, A. and Kuwada prepd. 2-methylfuran-3-carboxylic (II) acid and its di-CO₂H acid and compared their properties with those of I and the di-CO₂H acid obtained from I. II was obtained by treating the mixt. of (ClCH₂)₂O and AcCH₂CO₂Et with NH₃ according to Benary's method (*C. A.* 5, 1766). Since II thus prepd. m. 101°, I is not II. (I m. 134°.) II was then converted into the acid chloride according to Hill and Sawyer (*Ber.* 27, 1569), and treated with Br in sunlight. The product contained Br on the furan nucleus, instead of the expected BrCH₂ group, as the Br cannot be split off with PbO. Only after the aldehyde group was oxidized and treated with NH₄Cl and Zn dust, was the Br removed, and furan-2,3-dicarboxylic acid obtained. This di-CO₂H acid, C₆H₄O₄, m. 221°. Since these properties are exactly identical with those of the di-CO₂H acid obtained from I under similar conditions, the original contention is correct, i. e., elsholtzic acid is 3-methylfuran-2-carboxylic acid. On hydrolysis of the Br deriv. of II, which has 1 Br in the Me group and the other on the furan nucleus, 2-hydroxymethylbromofuran-3-carboxylic acid is obtained. Therefore, the Br must rearrange during the process. This rearrangement is shown not to be caused by high temp., since exactly the same results were obtained at 130-40°, or at 170-80°.

S. T.

Some polypyrroles. ANTONIO PIERONI AND ALDO MOGGI. *Gazz. chim. ital.* 53, 120-35 (1923).—It has long been known that pyrrole and its derivs. give brown oxidation products. Angeli (*C. A.* 11, 793; 10, 613) noted the analogy between these products and various pigments that occur in nature and obtained various pyrrole blacks by oxidizing pyrrole itself. P. (*Atti accad. Lincei* 30, II, 268 (1921)) developed a method for detecting and isolating the pyrrole nucleus by means of its reaction with azoxyamides (I), giving azopyrroles. Angeli (*Atti accad. Lincei* 30, II, 374 (1921); cf. *C. A.* 15, 2278) later prepd. 4 others of which *p*-BrC₆H₄N(:O):NCONH₂ (II) is best suited for this purpose. Although diazonium salts react well with pyrrole they do not react well with its derivs., while I reacts well with both. A further study of the comparative behavior of I toward various pyrrole derivs. is to be made. With β -naphthylazoxycar-

in this type of work. For expl. details see the original. E. J. WITZMANN

Cleavage of γ,γ' -dipyridyl with cyanogen halide. W. KÖNIG with G. EBERT and C. CENTNER. *Ber.* 56B, 751-8 (1923); cf. Ebert, *Diss. Dresden* 1913; Weitz and König, *C. R. 171*, 1473. —E, had shown that γ,γ' -dipyridyl (I) with PhNH_2 and excess of BrCN gives a deep violet-red bispentamethine dye (II), which could not be isolated in pure form, as it decomps. with great ease into PhNH_2 and a N,N' -diphenyldipyridylium salt (III). It has always been assumed that the opening of the $\text{C}_5\text{H}_4\text{N}$ ring by BrCN is brought about by addn. of the BrCN to the N with subsequent migration of the halogen to an adjacent C atom, but such addn. products had hitherto never been isolated. It has now been found that when special precautions are taken (careful exclusion of moisture) it is possible to obtain from BrCN and I the addn. product, *N-bromocycano- γ,γ' -dipyridyl* (*N-cyano- γ,γ' -pyridylpyridylium bromide*) (IV) (1.2 g. from 1 g. I in abs. alc. and 6.5 cc. of 2 N BrCN in Et_2O , decompn. 140°, becomes yellow on heating, yielding BrCN and a sublimate of I, which is also formed when IV is treated with NaOH. IV has only a very slight tendency to undergo cleavage in the presence of aromatic amines; with PhNH_2 it gives a red color, to be sure, but yields no detectable amt. of either the dye II or the salt III; on the other hand, I is formed in abundance and can be isolated in the form of its salts (*monohydroiodide*, brown-yellow leaflets with H_2O , begins to sublime 65°). When 5 g. I in a little alc. is treated with 32 cc. of 2 N BrCN and then with 12 g. PhNH_2 , the ppt. of IV redissolves and the resulting cherry-red soln. changes to an intense violet-red with evolution of so much heat that the Et_2O begins to boil; on standing, more quickly on the H_2O bath, the soln. becomes discolored and deposits a dirty brown solid; after distn. with steam to remove the PhNH_2 , alc. and Et_2O , followed by boiling with charcoal and filtration, the soln. readily yields the salts III: *Dichlororate*, faintly green-yellow, m. 299° (decompn.); *dipicrate*, yellow, m. 170°; *chloroferrate*, $\text{C}_{10}\text{H}_8\text{N}_2\text{Cl}_2\text{Fe}_2$, yellow, m. 210–5°; *diiodide*, seps. on addn. of KI to a concd. soln. of the bromide as a cryst. yellow ppt. (apparently an unstable polyhydrate), changing on standing or heating to a cinnamon-red form with 0.5 H_2O ,

which *in vacuo* at 65° or on boiling with Ac_2O goes over into the anhyd. deep red form, turns dark red at 70°, decomps. without melting at higher temps. K., E. and C. also observed the color reaction of the diiodide described by Weitz and König (the green color produced in the presence of certain reducing agents and destroyed by air), which is especially striking in hot AcOH with Zn dust and in H_2O with free NH_4OH ; the green compd. can also be produced in aq. alk. solns. in the presence of $\text{Na}_2\text{S}_2\text{O}_4$, Zn dust, FeSO_4 , etc. The green compd. is believed to be, like the blue substance from dibenzylpyridylium salts, a merquinoid compd. (cf. Emmert and Varenkamp, *C. A.* 17, 762).

C. A. R.

Substitution in the pyrazole series. Halogen derivatives of 3,5-dimethylpyrazole. G. T. MORGAN AND ISIDORE ACKERMAN. *J. Chem. Soc.* 123, 1308-18 (1923).—The diazo derivs. have been studied as a means of prepg. the substitution derivs. of 3,5-dimethylpyrazole (I), but the results showed that the yields were less than by direct halogenation. Iodination occurs much more readily than in the C_4H_4 series. The 4- NO_2 deriv. is best prepd. by adding 6 cc. HNO_3 (d. 1.42) to 10 cc. concd. H_2SO_4 contg. 5 g. I at 0°, adding 20 cc. additional H_2SO_4 , allowing to stand overnight and then heating 3-4 hrs. at 160°. The reduction to the 4- NH_2 deriv. is best carried out in moist Et_2O with Al-Hg, the yield being 85%. *Benzylidene deriv.*, m. 139-40°; *o-Nitrobenzylidene deriv.*, greenish yellow turning reddish brown on exposure to light and air, m. 101°; *m-isomer*, light yellow, m. 236°; *p-isomer*, golden yellow, m. 198°. Aq. HCHO gives the complex $[\text{HOCH}_2\text{N:N:CMe.C(N:CH}_2\text{):CMe}]_n$, does not m. 300°. The

diazonium chloride condenses with β -diketones and β -keto esters in the presence of aq. AcONa . *4-Azoacetylacetone deriv.*, golden yellow, m. 184° (decompn.). *4-Azobenzoylacetone deriv.*, light yellow, m. 169-70° (decompn.). *Et 3,5-dimethylpyrazole-4-azoacetate*, orange-yellow, m. 157°. These derivs. gave red Na salts which developed intense red colors with FeCl_3 . *4-Iodo-3,5-dimethylpyrazole* (II), m. 137°, is obtained in 60% yield from boiling aq. KI and the diazonium chloride, or in quant. yield by heating I, I in KI, AcONa and H_2O . *Ac deriv.*, m. 62.5-3.5°. *Bz deriv.*, m. 82°. *Chloroaurate*, orange-yellow, m. 174°. *Chloroplatinate*, light orange, m. 215-20°. *Dichloride*, yellow, m. 85-88°, by passing dry Cl into II in CHCl_3 ; it is very volatile at the ordinary temp. and the vapor is lachrymatory. The action of dil. aq. NaOH is complicated and destructive and an iodoso deriv. could not be isolated. *Dibromide*, brick-red, m. 78-81°; this also is volatile and lachrymatory. *Iodochloride hydrochloride*, yellow, m. 111° (decompn.), from ICl.HCl and I in concd. HCl ; it is hydrolyzed by H_2O , liberates I from KI and S from aq. $\text{Na}_2\text{S}_2\text{O}_3$. 10% NaOH decomps. it quant. into II. Dil. EtOH transforms it into the HCl salt of II, m. 195°. II with alk. KMnO_4 gives *4-iodopyrazolecarboxylic acid*, amorphous, decomp. above 70°; *Ag salt*; and *4-iodo-3-(5)-methylpyrazole*, m. 185-7°; *chloroaurate*, orange-yellow; *chloroplatinate*, orange-yellow. With neutral KMnO_4 the product is *4-iodo-3-(5)-methylpyrazolecarboxylic acid*, amorphous, m. 237°; *Ag salt*. *4-Bromo-3,5-dimethylpyrazole*, m. 118°; *chloroaurate*, orange-red, m. 126-8°. *Ac deriv.*, m. 38°; *Bz deriv.*, m. 48-9°. *Perbromide*, by adding Br to I in concd. HCl , orange-red, m. 142-4°. On warming with EtOH , the HBr salt, m. 174°, results. *4-Chloro-3,5-dimethylpyrazole*, m. 95°, results by passing Cl into aq. I. It is less basic than the Br or I derivs. and does not yield Ac or Bz derivs. I, warmed with fuming H_2SO_4 (20% SO_3) on the H_2O bath for 6 hrs., gives the *4-SO_3H acid*, contg. 1.5 H_2O , m. 287-8°; the H_2O is lost at 115°. *Chloride*, m. 100°.

C. J. WEST

The action of ammonium cyanide on diketones. H. D. DAKIN AND C. R. HARRINGTON. *J. Biol. Chem.* 55, 487-94 (1923).—The action of NH_4CN upon α -diketones does not lead to NH_2 nitriles giving NH_2 acids on hydrolysis. In some cases complex reactions with formation of glyoxaline derivs. take place, while in others rupture of the C chain occurs between the two CO groups. Bz_2 and NH_4CN give BzNH_2 and PhCH(OH)CN almost quant. Derivs. of Bz_2 act in an analogous fashion. Ac_2 and phenylglyoxal give glyoxaline derivs.

A. P. LOTROP

Benzobisthiazoles. III. S. R. H. EDGE. *J. Chem. Soc.* 123, 1011-4 (1923); cf. *C. A.* 17, 1469.—Because of criticism of the earlier work and the conclusion that a sym. and not an unsym. 3-ring structure was obtained, it was desirable to det. whether the method employed for making benzobisthiazoles would yield a sym. 3-ring structure easily or not. 2,6-(AcNH) $_2\text{C}_6\text{H}_3\text{Me}$, m. 302-3° (Green, *J. Chem. Soc.* 59, 1017, gives 202°). *Dithioacetyl-2,6-tolylenediamine*, m. 275°. Alk. $\text{K}_4\text{Fe(CN)}_6$ gave 2,4,6-trimethylbenzobisthiazole, dull pale yellow, m. 185-6°, b_p 280°; the reaction takes place almost at once. The *methiodide*, m. 211° (heated quickly) or 203-5° if heated slowly. No evidence of the existence of diacid salts or of a dimethiodide was obtained. C. J. W.

Synthesis of β -arylsulfonylquinolyl- α -arylsulfonylmethanes and of α -phenyl- β -arylsulfonylquinolines. J. TRÖGER AND K. VON SHELLEN. *J. prakt. Chem.* **105**, 208-31 (1923).—In these syntheses it is very important to control temp., time of heating and the purity of the starting materials: β -Benzenesulfonylquinolyl- α -benzenesulfonylmethane m. 168°, results by heating diphenylsulfonylacetone and an excess o -H₂NC₆H₄CHO in a sealed tube 2.5 hrs. at 160°. It has no basic properties. β -*p*-Toluenesulfonylquinolyl- α -*p*-toluenesulfonylmethane, m. 202°, by heating di-*p*-toluenesulfonylacetone and o -H₂N-C₆H₄CHO, 15 min. at 155°. β -Chlorobenzenesulfonylacetone, m. 83°, results by warming p -ClC₆H₄SO₂Na and ClCH₂Ac in EtOH for 1 hr. Phenylhydrazones, m. 161°. One mol. Br in AcOH gives the bromo deriv., ClC₆H₄SO₂CH₂COCH₂Br, m. 142°. When this bromide is heated with ClC₆H₄SO₂Na, di-*p*-chlorobenzenesulfonylacetone, yellowish white, m. 166°, results. β -*p*-Chlorobenzenesulfonylquinolyl- α -*p*-chlorobenzenesulfonylmethane, yellow, m. 197°, by heating (ClC₆H₄SO₂CH₂)₂CO and o -H₂NC₆H₄CHO 15 min. at 165°. β -Chlorobenzenesulfonyl-*p*-toluenesulfonylacetone, pale yellow, m. 163°. Oxime, m. 214°. β -*p*-Chlorobenzenesulfonylquinolyl- α -*p*-toluenesulfonylmethane, m. 199-200°. Benzenesulfonyl-*p*-chlorobenzenesulfonylacetone, yellowish white, m. 129-30°. Semicarbazone, yellowish white, m. 231°. β -*p*-Chlorobenzenesulfonylquinolyl- α -benzenesulfonylmethane, grayish white, m. 157°. β -Naphthalenesulfonyl-*p*-chlorobenzenesulfonylacetone, yellow, m. 187°. β -*p*-Chlorobenzenesulfonylquinolyl- α -(β)-naphthalenesulfonylmethane, m. 163°. In each of the above methane derivs., the α -SO₂R group is split off by hydrolysis with HCl. α -Phenyl- β -benzenesulfonylquinoline, yellowish white, m. 208.5-9.5°, results by heating benzenesulfonylacetophenone and o -H₂NC₆H₄CHO 1-2 hrs. at 200°. HCl salt is decompd. by H₂O and slowly loses HCl in a desiccator, rapidly at 105°. Nitrate, more stable than the HCl salt. Acid sulfate, slowly splits off the acid in the cold. Perchlorate; chloroplatinate, yellow. α -Phenyl- β -*p*-toluenesulfonylquinoline, m. 243°. Perchlorate, very stable. Nitrate. Chloroplatinate, orange. α -Phenyl- β -*p*-chlorobenzenesulfonylquinoline, yellowish white, m. 237°. Nitrate; perchlorate, yellowish white; chloroplatinate, orange-yellow. C. J. WEST

The action of sodamide on pyridine, and some properties of α -aminopyridine. J. P. WIRAUT AND ELISABETH DINGEMANSE. *Proc. Acad. Sci. Amsterdam* **25**, 458-62 (1923).—NaNH₂ and C₄H₅N give, besides C₄H₄NNH₂, several other C₄H₅N derivs., among which γ , γ -dipyridyl predominates. A more detailed account of these reactions is to be published later. R. CHESTER ROBERTS

Relation between chemical constitution and pepper taste. I. H. STAUDINGER AND HERMANN SCHNEIDER. *Ber.* **56B**, 699-711 (1923).—Crystd. piperine (I) has only a very slightly sharp taste while an alc. soln., even when very dil., is so sharp that the characteristic pleasant taste of pepper does not appear. Again, if I is ground with 20 parts flour only a short time (6 hrs.) the product has only a faint pepper taste, while after 10 days' grinding it has the same sharpness as pepper. There seems to be no doubt, therefore, that I is the chief active principle of pepper and that the characteristic pepper taste is produced by a reaction with colloidal substances on the tongue and is therefore dependent on a suitable degree of dispersion of the I. A systematic study has shown that the I mol. can be varied considerably without destroying the pepper taste. An essential factor is the amide-like union of piperidine (II) with an aliphatic-aromatic acid and the taste is most pronounced in derivs. of δ -phenylvaleric acid, so that the grouping Ph.C.C.C.CON(CH₂.CH₂)₂CH₃ seems to be of importance for the production of the pepper taste. The II salt of piperic acid (III) is not sharp, showing that the amide union in I is essential for the pepper taste. On the other hand β -cinnamyl-acrylic piperidide (IV) has an even sharper taste than I, a 2.5% mixt. of IV having about the same sharpness as ground pepper, which contains 5-10% of I. The same is true of the allo-isomer (V) of IV. The methylenedioxy group in I is therefore not essential for its taste. The δ dihydro and the tetrahydro derivs. of IV have an equally strong pepper taste, which consequently does not depend on the double bonds. Tetrahydropiperine (VI) likewise has a pepper taste. The piperidides of sorbic and many other purely aliphatic or purely aromatic acids either have an unpleasant burning taste or are tasteless. Cinnamylidenemalononic acid (VII) is obtained in 88.6% yield from 189 g. PhCH:CHCHO and 1.5 mols. CH₃(CO₂)₂Ca in 400 g. AcOH heated at 60-70° until the mass solidifies (0.5-1.0 hr.), then 2 days at 80° and 1 day at 100°; with PCl₅ in C₆H₆ it gives the golden yellow chloride, m. 83°; the piperidide, prepd. by the Schotten-Baumann method, has no pronounced pepper taste. β -Cinnamylacrylic acid (VIII), m. 165°, was prepd. by Döbner's method (condensation of PhCH:CHCHO with CH₃(CO₂H)₂ in the presence of C₆H₅N; with quinoline as the condensing agent, the alloisomer (IX) of VIII, m. 138°, is obtained). The acid pyridine salt of VII m. 114-5° with evolution of CO₂

and formation of a mixt. of about 60% VIII and a low melting acid, and the acid quino-line salt m. 114-5° and decmps. about 130° with formation chiefly of IX and only very little VIII. Chloride of VIII, from the acid refluxed 4 hrs. in petroleum ether with SOCl_2 , m. 47° (that of IX has thus far not been obtained in cryst. form). IV m. 91-2° (Riedel, C. A. 2, 2238, gives 203°, and his product was evidently not IV). V could not be obtained cryst. and could not be distd. even in a high vacuum without decmpn. The β,γ -dihydro deriv. of VII decmps. in boiling H_2O with formation of 90-5% of phenyl- β,γ -pentenic acid (X), whereas with 4 parts of boiling 5% $\text{C}_6\text{H}_5\text{N}$ it gives 90% of a mixt. contg. about 30% X and 70% of its α,β -isomer (XI). Chloride of XI, prepd. with excess of SOCl_2 , b_{11} 149-50° (yield, 68%); *Et(t) ester*, b_{11} 156-8°; *piperidine*, obtained in 77% yield from the acid heated 24 hrs. with II at 195-200°, also made by the Schotten-Baumann method, b_{0-2} 184-9°. Chloride of X, b_{11} 139-40°, b_{0-2} 98-100°; *Et ester*, b_{11} 154-6°; *piperidine* (17-8 g. from 17 g. of the acid heated 7 hrs. at 80-90° with 8.5 g. II), b_{0-2} 163-5°. Chloride of the γ,δ -isomer of X, b_{0-11} 100-5°; *piperidine*, faintly yellow, b_{0-2} 165-7°. α -Phenylcinnamylacrylic chloride, from the acid heated a long time with SOCl_2 in C_6H_6 , m. 87-9°; *piperidine*, m. 135°, has no sharp taste when ground with flour. Sorbic chloride, obtained in 50% yield from the acid and SOCl_2 in boiling C_6H_6 , b_{11} 69-71°; *piperidine*, m. 83-4°. The following *piperidides* have an unpleasant, generally not very sharp taste or are tasteless: *valeric*, b_{11} 122-5°; *caproic*, b_{11} 140°; *heptylic*, b_{11} 158-62°; *acetic*, b_{10} 125°; *crotonic*, b_{10} 160°; *palmitic*, m. 35-6°; *mono-Me malonic*, b_{0-2} 130-5°; *benzoic*, m. 48°; b_{15} 180°; *p-methoxybenzoic*, m. 35°, b_{16} 210°; *methylpropylolactate*, m. 45°; α -*naphthoic*, m. 85-7°; β -*naphthoic*, m. 88-90°; *toluene-p-sulfonic*, m. 98-9°; *cinnamic*, m. 122°; *p-methoxycinnamic*, b_0 200-10°; *methyleneacetic*, m. 80-2°. II. Aliphatic-aromatic acid *piperidides*. H. STAUDINGER and FRITZ MÜLLER. *Ibid* 711-5.—The taste of *piperidides* of aliphatic-aromatic acids with 2-, 4- and 6- CH_3 groups is sharper than that of those with 1-, 3- and 5- CH_3 groups. With the unsatd. acids the relationship between taste and constitution is not so clear. The following *piperidides* are described: Phenylacetic, b_{0-2} 138-9°; *hydrocinnamic*, b_{0-14} 147-50°; γ -phenylbutyric, b_{0-2} about 155° (the acid, m. 46-7°; is obtained in 94% yield from $\text{BzCH}_2\text{CH}_2\text{CO}_2\text{H}$ heated 5 hrs. at 180° with N_2H_4 , H_2O and NaOEt); δ -phenylvaleric, b_{0-2} about 164° (the acid, m. 57°, was prepd. from $\text{Ph-CH}_2\text{CH:CHCH}_2\text{CO}_2\text{H}$ and H in alc. with Pt or in neutral aq. soln. with Pd); ϵ -phenylcaproic, faintly yellow, b_{0-2} about 177°. prepd. through the chloride, b_{11} 151-2°; ζ -phenylheptylic (ζ -phenylanthracic), b_{0-2} 184-8°, prepd. through the chloride, b_{11} 166-8°; γ -phenyl- β,γ -isocrotonic, m. 64-5°. C. A. R.

γ -Piperidone ring. II. L. RUZICKA and C. F. SEIDEL. *Helvetica Chim. Acta* 5, 715-20(1922); cf. C. A. 15, 515.— γ -Piperidone is not capable of existence in the free state; substitution of the reactive NH group, however, gives a stable compd. *Et β -[4-ketopiperidino]-propionate*, thick oil, b_{0-2} 100-10°, results by condensing $\text{N}(\text{CH}_2\text{CH}_2\text{CO}_2\text{Et})_3$ by Na in $\text{C}_6\text{H}_5\text{Me}_2$ or better in C_6H_6 with EtONa ; reduction gives the *q-HO* deriv., b_{0-2} 125°, the benzoyl deriv. of which m. 195°. (With V. FORNASINI.) *Et iminoacetate- β -propionate*, $\text{EtO}_2\text{CCH}_2\text{CH}_2\text{NHCH}_2\text{CO}_2\text{Et}$, b_{0-2} 100-5°, from $\text{ICH}_2\text{CH}_2\text{CO}_2\text{Et}$ and $\text{EtO}_2\text{CCH}_2\text{NH}_2$, HCl; benzoyl deriv. b_{0-2} 170-80°. Condensation of this with Na and hydrolysis of the product with HCl gave no definite result, perhaps because of the tendency of the resulting β -pyrrolidone to polymerize. On the other hand the same treatment applied to benzoyl- β,β' -iminodipropionic ester readily gave dibenzal- γ -piperidone. C. J. WERT

Synthesis of the asymmetric homotetrahydroisoquinoline. JULIUS V. BRAUN and FRIEDRICH ZOBEL. *Ber.* 56B, 690-6(1923); cf. C. A. 7, 1879.—*o*-Methoxy-*o*-tolunitrile, obtained in 90% yield from *o*- $\text{ClCH}_2\text{C}_6\text{H}_4\text{CN}$ and NaOMe , b_{14} 114°, on reduction at 100° in tetra- or decahydronaphthalene with Ni salts as catalysts (cf. Schroeter, C. A. 16, 1768) it gives a mixt., in the ratio 2:1, of the bases *o*- $\text{MeOCH}_2\text{C}_6\text{H}_4\text{CH}_2\text{NH}_2$ (I) and *o*- $\text{MeOCH}_2\text{C}_6\text{H}_4\text{CH}_2\text{NH}$ (II). I b_{11} 127-8°; HCl salt, m. 113°; *picrate*, m. 164°; *Bs deriv.*, m. 71°. II b_{11} 200-5°; the HCl and NO compds. are oily; *picrate*, m. 156°. Similarly, *o*- $\text{PhOCH}_2\text{C}_6\text{H}_4\text{CN}$ at 10° gives, in the ratio 4:1, the bases *PhOCH}_2\text{C}_6\text{H}_4\text{CH}_2\text{NH}_2, b_{11} 195-200°, m. 26-7° (HCl salt, m. 200°; *picrate*, m. 190°), and *PhOCH}_2\text{C}_6\text{H}_4\text{CH}_2\text{NH}, m. 53°, decmps. somewhat on distn. (HCl salt, m. 158°). *o*-Methoxy-*p*-tolunitrile, obtained in 90% yield from $\text{BrCH}_2\text{C}_6\text{H}_4\text{CN}$, b_{11} 126-7°, gives *p*-methoxymethylbenzylamine, b_{11} 125-30° (HCl salt, m. 205°; *picrate*, m. 179°; *Ac deriv.*, m. 86-7°; phenylthiourea, m. 102-3°), and the sec. amine, b_{11} 195-200° (HCl salt, m. 215°; *NO deriv.*, m. 120°). *o*- γ -Phenoxypropylbenzylamine (III), obtained in 30% yield from $\text{PhO}(\text{CH}_2)_3\text{C}_6\text{H}_4\text{CN}$, b_{11} 230°, m. 55°; HCl salt, m. 154°; *picrate*, light yellow, m. 171°. Heated 3 hrs. at 130° with 5 parts concd. HCl, III yields almost quant. the HCl salt, m. 172°, of *o*- γ -chloropropylbenzylamine, an oil stable for some time when**

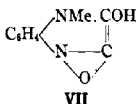
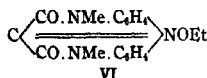
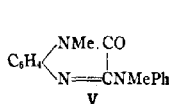
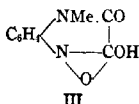
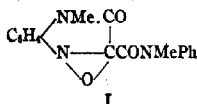
liberated from its salts in the cold and forming a *picrate* m. 175°; the HCl salt treated with excess of dil. alkali, heated 15 min. on the H₂O bath and distd. with steam gives *asym-homotetrahydroisoquinoline*, $C_8H_9 \cdot CH_3 \cdot CH_2 \cdot CH_2 \cdot NH \cdot CH_3$, b_p 120°, quickly

becomes covered in the air with a crust of the carbonate, is stable for a few moments towards ice-cold KMnO₄ in H₂SO₄; HCl salt, very rapidly deliquesces in the air; *chloroplatinate*, m. 192°; *NO deriv.*, m. 73-4°; quaternary *N-Me methiodide*, m. 182°.

C. A. R.

Oxime of mesoxamide (isonitrosomalonalide) and some allied compounds. III. Ring formation in the tetrasubstituted series. EDITH H. USHERWOOD and MARTHA A. WHITELEY. *J. Chem. Soc.* 123, 1069-89(1923); cf. *Ibid* 83, 43(1903).—3,4-Oxido-2-keto-1-methyl-1,2,3,4-tetrahydroquinoxaline-3-carboxymethylanylilide (I) has been prepd. (1) from (MeNPhCO)₂C.NH.O (II) with NOCl and HNO₃, (2) by the action of H₂O on

II in CHCl₃ satd. with NOCl, (3) by the action of CrO₃ and (4) by the action of HNO₃. I is pale yellow, has a bitter taste and m. 190-1°; *acetate*, m. 226°; *Cl deriv.*, m. 240-1°, from alc. or aq. HCl and I. By-products of the 1st method of prepn. are: *Nitromalonodimethylanylilide*, m. 156°; *K salt*, pale yellow with bitter taste. *Cl deriv.*, m. 132-4°, formed in small amts. by the action of HNO₃ upon a CHCl₃ soln. satd. with NOCl. *Chloromalonodimethylanylilide*, m. 185°. In the 2nd method of prepn. *mesoxalodimethylanylilide*, (CONMePh)₂CO, pale yellow, m. 171°, is also formed, prepd. also by the action of N oxides on II in moist CHCl₃, EtOH or AcOH. A 2nd product is the *compd.* C₁₇H₁₅O₄N₃, pale yellow, m. 170°. I with alk. KMnO₄ gives methylphenyloxamic acid. When I is warmed with EtONa until soln. results and then acidified, 3,4-oxido-2-keto-3-hydroxy-1-methyl-1,2,3,4-tetrahydroquinoxaline (III), m. 257°, results. Na and K salts, m. 167-8°. III with Zn dust and boiling AcOH gives 2-keto-3-hydroxy-1-methyl-1,2-dihydroquinoxaline, m. 281-3°; this was identified by conversion into 2,3-dichloro- or dibromoquinoxaline and by synthesis by heating *o*-H₂NC₆H₄NHMe with (CO₂H)₂. I with Zn and glacial AcOH gives 2-keto-1-methyl-1,2,3,4-tetrahydro-



quinoxaline-3-carboxymethylanylilide, m. 185°, which, heated with EtONa, yields 2-keto-1-methyl-1,2-dihydroquinoxaline-3-carboxylic acid (*Ber.* 39, 1325), which decomps. at its m. p., giving 2-keto-1-methyl-1,2-dihydroquinoxaline (IV). An attempt was made to synthesize IV by condensing *o*-H₂NC₆H₄NHMe with HO₂CCHO, but the resulting product was 1-methylbenzimidazole-2-carboxylic acid, m. 98-9°, which loses CO₂, forming *N*-methylbenzimidazole (*Ber.* 25, 2711). *Glycineanilide carbonate*, by the action of H₂NCH₂COCl on PhNH₂, and treatment of the residue with Na₂CO₃ condenses with HCO₂H to give 2-hydroxy-4-keto-3-phenyltetrahydroglyoxaline or formylaminoacetanilide, m. 148-50°; *acetate*, m. 168-71°. When I is stirred gradually into concd. H₂SO₄ in a freezing mixt., and then poured into water, the main product is 3-phenylmethylamino-2-keto-1-methyl-1,2-dihydroquinoxaline (V), m. 135°, as long thin red prisms which gradually change to well formed octahedral prisms. *Chloroplatinate*, yellow; *methiodide*, greenish yellow, m. 205°. *NO deriv.*, m. 197°. Zn and AcOH yield a base, C₁₄H₁₁ON₃, yellow, m. 140-1°. If concd. H₂SO₄ is added to I, there is an evolution of CO₂; crystd. from EtOH, 6,8-diketo-5,9-dimethyl-5,6,8,9-tetrahydromalonanilinium ethoxide (VI) results, pale yellow, m. 240°; *methoxide*, pale yellow, m. 276-8°. When nitromalonodimethylanylilide is stirred into concd. H₂SO₄, the products are 3,4-oxido-2-hydroxy-1-methyl-1,4-dihydroquinoxaline (VII), bright yellow, m. 192-4°, and some V. If the Na salt is treated with H₂SO₄, the products are V and VII.

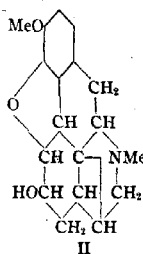
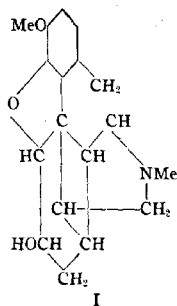
C. J. WEST

Chemical constituents of the Rutaceae. H. THOMS. *Ber. pharm. Ges.* 33, 68-83(1923).—The paper is devoted essentially to a description of the procedure followed

in isolating the chem. constituents of the domestic *Dictamnus albus* L., the dried rootlets of which were made to yield on alc. extrn. the following: a saponin, sucrose, invert sugar, pentose, a lactone, alkaloid, essential oil, wax-like substance and a phenoicarboxylic acid. Special methods remain to be developed for obtaining the various substances in max. yield. The lactone, *dictamnolactone*, $C_{16}H_{14}O_4$, m. 279–80°; $[\alpha]_D^{20}$ 30.26° in alc. KOH, $[\alpha]_D^{15}$ –102° in AcMe, yields with AcOH prismatic starry clusters, m. 290–1°, a fact pointing to a near relationship or possible identity with evodin (cf. Asahina, C. A. 17, 2441; Keimatsu, J. Pharm. Soc. Japan, No. 248, 1902). The alkaloid *dictamnine*, $C_{21}H_{19}O_2N$, m. 132–3°, is optically inactive, yields a *chloroplatinate*, $(C_{21}H_{17}O_2N.HCl)_2PtCl_4$, darkening 190°, sintering 210° but not molten at 230°, and an *aurate*, prisms, m. 152° (decomp. 171°).

W. O. E.

Morphine group. I. Discussion of the constitutional formula. J. M. GULLAND AND ROBT. ROBINSON. J. Chem. Soc. 123, 980–98(1923).—In this lengthy theoretical discussion a new formula (I) for codeine (morphine Me ether) is suggested, the main stages in the argument being: (a) Codeine is not unsatd. but contains a bridged ring. (b) The position of the bridge is deduced from (1) degradation of morphine or codeine to apomorphine and of codeine or thebaine to morphothebaine, (2) the relation of the morphine group to other opium alkaloids, (3) the consideration that in the decompn. leading to non-nitrogenous aromatic phenanthrene derivs. the breaking of a C-to-C



union occurs because the point of attachment of the ethanamine chain offers a structural obstacle to the formation of aromatic nuclei. (c) The formula so deduced provides a natural explanation of the codeine \rightarrow ψ -codeine transformation, the isomerization of α - and γ -methymorphimethines, the production of methylmorphol, morphenol, morphothebaine, etc., in the course of various degradations. (d) Thebenine is regarded as owing its production from codeinone and ψ -codeinone to a mol. rearrangement analogous to that of isoborneol to camphene. A conceivable alternative constitutional formula (II) accommodating the conditions mentioned in (b, 3) is found to be not so satisfactory a summary of the chemistry of morphine and its derivs. as I, which is adopted. A fairly complete bibliography of morphine and derivs. is appended. II. Thebainone, thebainol and dihydrothebainone. *Ibid* 998–1011.—The emulsions formed during the extrn. of thebainone (I) with $CHCl_3$ are avoided if the reaction product is treated with 10% NaOH until the soln. is very faintly acid to Congo red, the neutralization completed with $NaHCO_3$ and the ppt. allowed to settle overnight. *Benzylidenethebainone*, yellow powder, m. 120–3°, by heating I, BzH and KOH in dil. EtOH for 2 hrs. (yield, 90%). The HCl and H_2SO_4 solns. are deep red and become yellow on diln. *Picrate*, m. 194° (decompn.). *Methiodide*, yellow, m. about 193°. *Piperonylidenehebanone* (II), bright yellow powder, m. 128–30°. The HCl and H_2SO_4 solns. are reddish purple and become yellow on diln. A 5% AcOH soln. may be reduced by H and the colorless soln. gives no color with HCl but an orange color with NaOH. This probably contains homopiperonylthebainone. Further reduced in alk. soln. with Na-Hg, an oil is obtained (homopiperonylthebainol), which gives colorless solns. with both acids and alkalis. Condensation with piperonal gives a yellow product (piperonylidenehomopiperonylthebainol), which gives a deep red soln. in HCl or H_2SO_4 . These reactions indicate that II contains the grouping $CH_4O:C_6H_4CH:CCOCH:C-$. *Dianhydro- δ -aminopiperonalthebainone dihydrobromide*, orange-yellow, decompn. 258–60°, formed

by heating I with EtONa and 6-aminopiperonal in EtOH for 6 hrs., and then adding concd. HBr to the base in AcOH. The H_2SO_4 soln. has a bright emerald-green fluorescence. Thebainol (III) is derived from I by the addn. of 2 H atoms to the double bond and is not a sec. alc. as supposed by Pschorr, but a ketone, since it yields a semicarbazone. Crystd. from MeOH, III m. 50–54° but from Et₂O, III m. 135–6°; $[\alpha]_D^{25}$ 67.05° (EtOH, c 8.71); 33.07° (5% AcOH, c 2.368). Semicarbazone, m. 217–8°. *Methiodide*, m. 243° (decompn.); $[\alpha]_D^{25}$ 46.56° (H₂O, c 2.061). Reduction of thebaine gives dihydrothebainone, a tert. basic phenolic ketone, the semicarbazone of which m. 226–7° and contains 2H₂O. *Dipiperonylidenebainol*, orange-yellow powder, gives a purple soln. in H₂SO₄ and in HCl a deep pure blue soln., which becomes green and then a pale greenish yellow on diln. *Methylthebainol methiodide* (IV), m. 245° (decompn.). *Methyl-dihydrothebainone methiodide* (V), m. 257–8°. Amorphous products were obtained upon condensation of these ethers with piperonal; both are yellow and give a rich purple soln. in concd. H₂SO₄ and a deep green soln. in HCl-AcOH. That from IV m. about 156°, that from V about 166°. One mol. bromocodeinone-HBr liberates 0.97 atom I from KI, which is 0.5 the amt. anticipated on the assumption that the process is a straight reduction to codeinone. The sole evidence that codeinone contains a reactive methylene group is furnished by the formation of azo derivs. In order to make this test more stringent the behavior of a no. of the azo compds. on treatment with alkali has been examd. These azo derivs. are capable of passing into more intensely colored modifications in the presence of alc. KOH and therefore codeinone must contain the group $-\text{CH}_2\text{CO}-$. 18 of these derivs. are listed with their color before and after addn. of KOH.

Yohimbine (quebrachine). II. Apoyohimbine and deoxy-yohimbine. GEO. BARGER AND ELLEN FIELD. *J. Chem. Soc.* 123, 1038–43 (1923); cf. C. A. 9, 2888.—The compd. $\text{C}_{20}\text{H}_{25}\text{O}_4\text{N}_2\text{S}$ or $\text{C}_{21}\text{H}_{27}\text{O}_4\text{N}_2\text{S}$, earlier termed yohimbinesulfonic acid, is now shown to be *yohimbine sulfuric ester*, since H_2SO_4 is eliminated by heating with dil. NaOH or KOH above 60°. *Apoyohimbine* (I), $\text{C}_{20}\text{H}_{25}\text{O}_2\text{N}_2$ or $\text{C}_{21}\text{H}_{27}\text{O}_2\text{N}_2$, seps. in yields equal to 30% of the ester used; it m. 251–2° and is somewhat unstable, becoming colored on exposure to light or on prolonged heating at 120°. The AcOH soln. acquires a yellowish green fluorescence on standing. $[\alpha]$ is about 40°. *HCl salt*, m. 299–300°; soly. in H₂O at room temp., 1:1300. Acidification of the mother-liquor of I gave *anhydro-yohimbine sulfuric ester*, $\text{C}_{20}\text{H}_{23}\text{O}_4\text{N}_2\text{S}$, which, on hydrolysis, forms *apoyohimbic acid* (II), analyzed as the *HCl salt*, $\text{C}_{20}\text{H}_{23}\text{O}_4\text{N}_2\text{HCl}$, m. 301°. The free acid was amorphous. Esterification of the acid with MeOH and HCl gave I. Yohimbic acid (from yohimbine by the action of NaOH), upon soln. in concd. H₂SO₄, yields *yohimbic acid sulfuric ester*, $\text{C}_{20}\text{H}_{23}\text{O}_7\text{N}_2\text{S}$; hydrolysis gives II. Reduction of I by H (PdCl₂ as catalyst) gives *deoxy-yohimbine*, m. 200–3°, thus proving the presence of a double bond in I. It does not darken on exposure to light or on heating to 160° and forms a sparingly sol. *HCl salt*.

C. J. WESS

Aldehyde derivatives of cinchonine and of quinine and their acyclic compounds. L. SEKELIES. *Rec. trav. chim.* 42, 69–104 (1923).—The detn. of the constitution of the cinchona alkaloids was first undertaken by Gerhardt in 1842. Rabé (C. A. 2, 111, 1146; 3, 1522, 1939) first succeeded in making formulas for cinchonine (and cinchonidine) and quinine (and quinidine) that account for the known properties of these compds. The purpose of this work was to attach O₂ to the double bond of the vinyl group and to transform the ozonides thus obtained into the corresponding aldehydes by treatment with H₂O. Com. quinine sulfate was recrystd. from 96% EtOH, until the rotary power became const. The pure quinine (I) was liberated with NH₄OH, washed with H₂O, dried *in vacuo* over CaO at 50°. Cinchonine (II) was converted into the bisulfate with the calcd. amt. of H₂SO₄ and recrystd. from H₂O. The free base was liberated with NH₄OH and recrystd. from 95% EtOH until its rotation became const. The Ac derivs. (III) and (IV), resp., of I and II are described (Hess *Ann.* 205, 354 (1880)). The Bz derivs. (V) and (VI) of I and II were also prepd. With O₃ II reacts thus: $\text{C}_{17}\text{H}_{19}\text{N}_2\text{O} \cdot \text{CH} \cdot \text{CH}_2 + \text{O}_3 \rightarrow \text{C}_{17}\text{H}_{19}\text{N}_2\text{O} \cdot \text{CH} \cdot \text{CH}_2 \cdot \text{O}_3$ giving *cinchonine ozonide* (VII); the *quinine ozonide* (VIII)

$\text{C}_{19}\text{H}_{21}\text{N}_2\text{O}_4 \cdot \text{CH} \cdot \text{CH}_2 \cdot \text{O}_3$ was obtained similarly. These decomp. with H₂O, giving

$\text{C}_{17}\text{H}_{19}\text{N}_2\text{O} \cdot \text{CHO}$ and $\text{C}_{19}\text{H}_{21}\text{N}_2\text{O}_4 \cdot \text{CHO}$ (+CH₂O + H₂O₂), which are called *cinchoninal* (IX) and *quinininal* (X), resp. In order to avoid ozonizing the sec. OH group as well as the vinyl group the Ac and Bz derivs. of I and II were first used. Low concns. of O₃ (10.7 mg. O₃ per l.) were used to avoid attacking the quinoline radical. The alde-

hydes obtained were all pptd. by picric acid. S. found that this is also true with 3,2,4,6- $\text{Cl}_2(\text{O}_2\text{N})_2\text{C}_6\text{H}_2\text{OH}$ (XI) (called monochloropicric acid for brevity) and used this in order to simplify analysis of the salts formed in which a Cl detn. was sufficient. The synthesis of XI from $m\text{-ClC}_6\text{H}_4\text{NO}_2 \rightarrow \text{ClC}_6\text{H}_4\text{NH}_2 \rightarrow \text{ClC}_6\text{H}_4\text{OH} \rightarrow \text{XI}$ is described. Monochloropicric acid of I, could not be obtained; of II, yellow, m. 198°; of IV, greenish yellow, m. 188°; of VI, yellow, m. 140-1°; of III, tarred; of V, yellow-green, m. 129-30°. Dichloropicric acid of I, yellow, m. 217° (decompn.); of II, yellow-green, m. 209° (decompn.); of IV, yellow, m. 143-4°; of VI, yellow, m. 156°; of III, yellow, m. 139°; of V, yellow, m. 150°. 5.2 g. IV in 25 cc. dry CHCl_3 were treated at 0° with 70.1 l. ozonized air. The CHCl_3 was distd. off *in vacuo* and the ozonide was taken up in 10 cc. H_2O , boiled 2 mins. and poured into 1.69 g. PhNHNH_2 in 5 cc. 20% AcOH . From the oil acetyl-cinchoninal phenylhydrazone acetate, m. 106°, sepd.; this in EtOH with 10% NaOH gave the free base acetyl-cinchoninal phenylhydrazone, m. 135-42°. IV similarly treated with $p\text{-BrC}_6\text{H}_4\text{NHNH}_2$ gave the acetate, m. 105°, of acetyl-cinchoninal p -bromophenylhydrazone, m. 126°. The acetate, m. 228°, of the p -nitrophenylhydrazone, m. 134°, decompn. 140°, was obtained similarly. IV treated with O_3 as before gave on evap. the CHCl_3 a white powder from which was sepd. acetyl-cinchonine osonide (XIII), softens 75°, decompn. 95-100°. 15 g. of the above white powder were agitated 24 hrs. with 50 cc. H_2O . On adding 25% NH_4OH acetyl-cinchoninal (XIV) sepd. and after further purification, m. 109°. In hot H_2O XIII gives rise to tar and even in cold H_2O some is formed. XIV reduces Fehling soln. and $\text{Ag}_2\text{O-NH}_4\text{OH}$; $[\alpha]_D^{25.0}$ 28.2° (for IV $[\alpha]_D^{15.8}$ 110.4°). Four methods of sapon. were tried with XIV without success. The monochloropicate of XIV is scorified at 155° and then m.; the dichloropicate softens 154°, m. 165° (decompn.); the ammonia deriv., $\text{C}_{20}\text{H}_{26}\text{O}_4\text{N}_2$, m. 162° (decompn.); the NaHSO_4 deriv., $\text{C}_{20}\text{H}_{26}\text{O}_4\text{N}_2 \cdot \text{NaHSO}_4$, was not obtained pure. Benzoylcinchoninal deriv.: acetate, m. 127° of the phenylhydrazone, m. 117°; acetate, m. 112-4°, of the p -bromophenylhydrazone, m. 120-2°; acetate, m. 130-1°, of the p -nitrophenylhydrazone, m. 126-7° (decompn.). Benzoylcinchoninal osonide, m. 100° (decompn.). Benzoylcinchoninal (XV), m. 130° (decompn.), $[\alpha]_D^{22.2} -72.4^\circ$ (for VI $[\alpha]_D^{15.3} -24.7^\circ$); monochloropicate, m. 165°; dichloropicate, m. 165°; the ammonia deriv. was not certainly obtained. Acetylquininal deriv.: acetate, m. 65°, of the phenylhydrazone, m. 150°, decomp. 160°; p -bromophenylhydrazone, m. 120°, decomp. 137°, and its acetate; p -nitrophenylhydrazone, m. 125°, decomp. 155°. Acetylquininal osonide, softens at 75°, decomp. 90-125°. Acetylquininal (XVI), m. 120°, $[\alpha]_D^{22} -63.5^\circ$ (for III $[\alpha]_D^{14.4} -30.9^\circ$); monochloropicate, m. 166° (decompn.); dichloropicate, softens 138°; ammonia deriv., m. 82-5°. Benzoylquininal deriv.: acetate, m. 118°, decomp. 123°, of the phenylhydrazone, m. 128°, decomp. 130°; acetate, m. 118-9°, of the p -bromophenylhydrazone, m. 125°, decomp. 133°; acetate, m. 115° (decompn.), of the p -nitrophenylhydrazone, m. 133°, decomp. 141°. Benzoylquininal osonide, m. 95-100°. Benzoylquininal (XVII), scorified at 122°, m. 126°, $[\alpha]_D^{22.4} 79.4^\circ$ (for V $[\alpha]_D^{16.6} 118.1^\circ$); monochloropicate, m. 142° (decompn.); dichloropicate, m. 140°, blackens at 155°; ammonia deriv., m. 131-2°; the NaHSO_4 deriv. was obtained but probably does not exist in EtOH solns. too dil. When H_2O is added it gives XVII + NaHSO_4 again. Cinchoninal phenylhydrazone, m. 130-5°, decomp. 140°; p -bromophenylhydrazone, m. 120°, decomp. 140°; p -nitrophenylhydrazone, m. 130-2° (decompn.); VII, decomp. 105°. Cinchoninal (XVIII), m. 143-5°, $[\alpha]_D^{22.8} 100.5^\circ$; monochloropicate, scorified at 151°; dichloropicate, decompn. 155°; ammonia deriv., m. 105-10°; the NaHSO_4 deriv. was obtained but tarred in a few days. Quininal phenylhydrazone, m. 145-7°; p -bromophenylhydrazone, m. 125-30° (decompn.); VIII, decomp. 109°. Quininal (XIX), m. 160°, $[\alpha]_D^{19} -30^\circ$; monochloropicate, m. 130°; dichloropicate, m. 126° (decompn.); the NH_4 deriv. could not be obtained; NaHSO_4 deriv. was obtained.

E. J. WITZEMANN

Strychnos alkaloids. XXXVI. Preparation of methoxy- and ethoxydihydrostrychninolone, strychninolone-*c* and its oxidation. HERMANN LEUCHS AND RUDOLF NITSCHKE. *Ber.* 55B, 3738-45(1922); cf. *C. A.* 17, 2116.—The action of MeOH-KOH upon strychninolone-*a* (I) for 15 min. gives a mixt. of strychninolone-*c* (II) and methoxydihydrostrychninolone, obtained only as a resin, the *Ac* deriv. of which m. 237-9°. $[\alpha]_D^{18} -109^\circ$; it is difficultly sapond. in the cold by MeOH-NH_4 . EtOH-KOH and I likewise gave a mixt. of II and ethoxydihydrostrychninolone (III), m. 65-70°, then 100°. $[\alpha]_D^{18} -51.9^\circ$, which is sepd. by acetylating the mixt. and crystg. out the acetylstrychninolone-*c* (IV), m. 254-8°, $[\alpha]_D^{19} -231.3^\circ$, also obtained by the direct acetylation of II. An *Ac* deriv. of III could not be prepd. Oxidation of IV in AcMe with KMnO_4

gave an acid, $C_{21}H_{20}O_8N_2 \cdot H_2O$, sinters 260° , m. $280-2^\circ$ (decompn.), which has a bitter taste and gives a yellow-brown ppt. with $FeCl_3$, sol. in an excess of the reagent. Heated with 12 N HCl for 1 hr., $(CO_2H)_2$ is split off, giving an amorphous powder, sol. in H_2O with a green, in NH_4OH with a yellow color.

C. J. WAST

Preparation and determination of guanilic acid: the solubility of sodium guanylate in salt solutions and in water. R. FEULGEN AND H. ROSSENBECK. *Z. physiol. Chem.* 125, 284-8 (1923).—Solubilities in various concns. of $AcONa$ and $NaCl$ are given. For the former the soly. varies from about 2.5% in 0.86% $AcONa$ to about 0.1% in 54% $AcONa$; for the latter from 2.85% in 0.37% $NaCl$ to 0.2% in 23.4% $NaCl$. The presence of thymusnucleic acid does not affect its soly. The soly. in H_2O at 20° is about 3%.

R. L. STEHLE

The importance of diffusion in organic electrochemistry (WILSON, YOUTZ) 4. Unsaturation and molecular compound formation (MAASS, *et al.*) 2. Molecular refraction and molecular volume of aromatic nitro compounds (JANSEN) 2. Crystalline structure of anthracene (BRAGG) 2.

CUMMING, W. M., HOPPER, I. VANCE, WHEELER, T. SHERLOCK.: **Systematic Organic Chemistry.** London: Constable & Co., Ltd. 656 pp. 27s. 6d.

Benzoic acid. R. H. MCKEE and H. C. COOPER. U. S. 1,458,491, June 12. Liquid toluene is treated with a mixt. of chromic acid, H_2O and H_2SO_4 , toluene being used in excess of the proportion which would react with the chromic acid, to form benzoic acid dissolved in the excess toluene.

Nitrobenzoic acid. E. A. LLOYD and V. P. GERSON. U. S. 1,458,715, June 12. Nitrotoluene is treated with HNO_3 , further HNO_3 is added after the reaction has progressed and the strength of the acid is thus built up to effect oxidation and produce nitrobenzoic acid.

Treating ethylene with sulfuric acid. R. ENGELHARDT, W. LOMMEL and A. OSSENBECK. U. S. 1,458,646, June 12. C_2H_4 or its homologs are absorbed in concd. H_2SO_4 to which a Ag catalyst such as 0.1-0.2 Ag_2SO_4 has been added, in order greatly to increase the absorption. Foam-producing substances, *e. g.*, oils, CCl_4 or CS_2 , also facilitate absorption.

Stabilized metaldehyde. E. LUSCHER. Can. 232,079, June 19, 1923. Metaldehyde is stabilized by treating it with NH_3 or $(NH_4)_2CO_3$.

11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

Alexandre Besredka. D. NAI. *Biochim. terap. sper.* 9, 344-51 (1922).—Portrait and classified list of published papers of B.

H. W. BANKS, 3RD

Official memorial address on Riccardo Luzzatto. GIUSTO CORONEDI. *Biochim. terap. sper.* 10, 37-49 (1923).—Account of the life and work of L., with bibliography of his publications and portrait.

H. W. BANKS, 3RD

The colloid chemistry of the proteins. W. PAULI. *Kolloid Z.* 31, 252-6 (1922).—A discussion of recent work, with particular reference to the effect of neutral salts, effect of salts on protective action, and effect of fatty acids and soaps in pptn. of serum proteins. A dialyzer for the prepn. by electroendosmose of electrolyte-free proteins is described.

H. W. BANKS, 3RD

Colloid chemical classification of protein fractions (sensitizing and protective action of hydrophilic colloids). J. REITSCHÖTTER. *Kolloid Z.* 32, 47 (1923); cf. C. A. 17, 290.—Pure protein fractions were prepd. by the method of Pauli [preceding abstr.] and their powers of "sensitizing" Fe hydroxide sol to electrolytes were compared. Albumin is thus shown to carry a greater negative charge than paraglobulin, which is confirmed by cataphoresis expts. Paraglobulin fractions from diphtheria, and tetanus, sera show a significantly greater negative charge than the same fraction from normal sera.

H. W. BANKS, 3RD

The relationship of neutral salts to acid protein. SUSUMU MATSUMURA AND JOHANN MATULA. *Kolloid Z.* 32, 37-42 (1923).—The effect of $NaCl$ added to serum soln.

contg. HCl was studied by means of: (1) pptn. at room temp., (2) pptn. by heat and (3) sp. cond. From these expts. it is judged that there are 2 steps in the reaction between salt and acid protein: (1) Formation of a slightly hydrated complex of neutral salt-acid protein, by the formation of which the elec. cond. of the acid protein was but slightly changed (zone of decrease of viscosity). (2) A driving back of the ionization of this complex (zone of final pptn.).

H. W. BANKS, 3RD

The equilibrium gelatin-hydrochloric acid. R. DE IZAGUIRRE. *Kolloid Z.* 32, 47-51 (1923).—From electrometric detns. of H-ion concn. made by Lloyd and Mayers (*C. A.* 16, 3317) with gelatin-HCl mixts., the author concluded that at concns. of HCl < 0.04 *N* the acid was combined with the NH₂ groups; and > 0.04 *N* at the N of the peptide linkage. His own expts., however, do not support these views, as they show a logarithmic relationship which is quite analogous to the usual adsorption formula.

H. W. BANKS, 3RD

Cell enzymes. S. A. CHERIKOVSKI. *Dissertation* 1921, 12 pp. *Botan. Abstracts* 12, 122.—C. repeated the work of Abderhalden on specificity of cell enzymes. By using enzyme exts. from liver, muscle, spleen, and kidneys of rabbits, horses, and calves, and a peptone from each of the same organs he followed the hydrolysis of the peptone optically. He found that the kidney ext. hydrolyzed all the peptones prep'd., whereas the exts. from liver, muscle, and spleen were sp. for the peptones from their resp. organs. There was no 'species' specificity demonstrated.

H. G.

Growth and differentiation in tissue cultures. A. H. DREW. *Brit. J. Exptl. Pathol.* 4, 46-52 (1923).—The substances necessary for continuous growth which are present in exts. of embryonic tissues are able to pass through a Berkefeld filter. Adult tissues and tumors appear to contain these substances in lower concn. Tissues and tumors when grown free from connective-tissue elements grow as undifferentiated sheets. If connective tissue be added to such growths differentiation sets in. Autolyzed exts. of normal adult tissues contain a growth-activating substance which, when added to cultures of normal adult cells, causes very rapid proliferation. Exts. of tumors, prep'd. in the cold and not subjected to autolysis, also contain this substance, the tumor cells appearing to be able to form it continuously.

HARRIET F. HOLMES

Soaps and proteins. I. Colloid chemistry of soaps and soap manufacture. M. H. FISCHER, G. D. McLAUGHLIN AND M. O. HOOKER. *Kolloidchem. Beihefte* 15, 102 pp. (1922).—A monograph correlating the authors' work on the prepn. of soaps; the colloid-chemical systems soap-water, soap-alcohol; the theory of lyophilic colloids, hysteresis; swelling; syneresis; gelation; solvation; sol formation; the reaction of soaps to indicators; the physical condition of soap mixtures; the reversibility of soaps; the salting-out of soaps; the foam-forming, emulsion-forming soaps and the theory of detergent action of soaps. II. The colloid chemistry of soap formation. *Ibid* 16, 99-133.—A discussion of the compn. of oils, fats and waxes that enter into soapmaking, the significance of their phys. and chem. consts. in the colloid chemistry of soap, the hot and cold processes, the mechanism of emulsion formation on treating fats with alkali, the concn. and method of adding alkali for sapon., the changes that proceed in soap systems during cooling, the salting-out of mixed soaps, the final prepn. of the soap, some physicochem. consts. of commercial soaps, the transformation of one soap into another, the soap fillers and their effects. III. Analogies in the colloid chemistry of soaps, proteins and tissues. *Ibid* 134-74.—Amino fatty acids combine with bases to form compds. similar to those resulting from fatty acids and bases and their solubilities in and for water vary comparably as indicated by measurements of their colloidal properties. Studies of the systems globulin-water show that the water-dissolving capacities are K globulinate > Na globulinate > Ba globulinate > globulin (insol.). Globulins and salts yield derivs. of the type base-protein-acid whose water-sol. is greatly increased. Globulins in acids and bases show H and OH ions in very dil. systems and as a result of hydrolysis of the ion-protein combination their stabilities depend on such minimal ion adsorption. Similar studies were made with gelatin in water, acids and bases. Analogies of peptization and coagulation are made for soap and protein systems. The effects of metallic compds. on proteins are considered from the standpoint of their toxicity, which is attributed to their forming insol. products little hydrated. Antidotes do not ppt. the heavy metal salts but replace them by combining with the liberated proteins. IV. Physico-chemical constants of the fatty acids and alcohols. *Ibid* 175-9.

I. NEWTON KUGELMASS

Lipase studies. II. A comparison of the hydrolysis of the esters of the dicarboxylic acids by the lipase of the liver. ELIZABETH C. HYDE AND H. B. LEWIS. *J. Biol. Chem.* 56, 7-15 (1923); cf. *C. A.* 15, 3500.—"In confirmation of earlier work, the hydrolysis of the diethyl esters of succinic and malonic acids by lipase of hog liver was

observed to proceed rapidly to an equil. which corresponded to the removal of one ethyl group from the diethyl ester. In the hydrolysis of the diethyl esters of adipic and glutaric acids under like conditions, equil. was reached when the cleavage which corresponded to the removal of both the ethyl groups was nearly complete. The hydrolysis of these esters followed a course similar to that observed with the simple esters of the monocarboxylic acids. Adipic acid was isolated from the products of hydrolysis of diethyl adipate by liver lipase in expts. in which the hydrolysis was less than 50% complete. Under comparable exptl. conditions the rate of hydrolysis of the diethyl esters of malonic, succinic, glutaric and adipic acids increased with the increase in the mol. wt. of the acids." The hydrolysis of dibenzyl succinate has been shown to be complete in the organism of the rabbit and it is possible that the *in vitro* results obtained with the compds. used have little significance for the living organism. Further expts. in this connection are in progress.

A. P. LOTHROP

Histochemistry of melanin and adrenaline. H. KUTSCHERA. *Wiener klin. Wochschr.* 35, 554(1922); *Endocrinology* 6, 842(1922); cf. C. A. 17, 114.—Ammoniacal AgNO_3 is reduced *in vitro* by catechol and in the tissues by melanin and adrenaline. The pigment, lipofuchsin, which is found in the liver, heart and adrenals also reduces ammoniacal AgNO_3 , after it is freed of adherent lipins. It is suggested that lipofuchsin is a melanin-lipoid compd. The relation of chromaffin substance to the formation of adrenaline is discussed.

W. A. PERLZWEIG

Studies in the physical chemistry of proteins. II. The relation between the solubility of casein and its capacity to combine with base. The solubility of casein in systems containing the protein and sodium hydroxide. E. J. COHN and J. L. HENDRY. *J. Gen. Physiol.* 5, 521-54(1923); cf. C. A. 16, 3669.—Casein forms a well defined, sol. disodium compd. in systems contg. casein and varying amts. of NaOH. Soly. was detd. by the soly. of the casein mol. and the concn. of the disodium compd. One mol. NaOH combines with approx. 2100 g. casein. The equiv. combining wt. of casein for Na is $1/2$ the min. mol. wt. calcd. from the S and P content, and $1/8$ as calcd. from the tryptophan content. In systems contg. casein and small amts. of NaOH, the soly. of casein increases in direct proportion to the amt. of NaOH present. The concn. of the sol. Na casein compd. varies directly as the casein mol. (S_w), and as the consts., K_{a1} and K_{a2} , which define its acid dissociation. The soly. product const. $S_w K_{a1} K_{a2} = 2.2 \times 10^{-12}$ g. casein per l. at 25° . The soly. of the casein mol. as estd. from this const. and the relation between the soly. of casein and the NaOH concn. was 0.09 g. per l. at 25° . The product of K_{a1} and K_{a2} is therefore 24×10^{-14} N.

CHAS. H. RICHARDSON

Sensory adaptation and the stationary state. S. HECHT. *J. Gen. Physiol.* 5, 555-79(1923).—Expts. on the mollusc, *Mya arenaria*, demonstrate that the amt. of outside light energy necessary to stimulate an animal adapted to continuous illumination increases with the intensity of this adapting illumination. The data are analyzed quant. in terms of a reversible photochem. reaction. The amt. of photochem. decompn. required to set off the sensory mechanism is const. There is a stationary state in the reversible reaction during which the concns. of the 3 components are const.; this permits the animal to come into sensory equil. with any sustained illumination. The concns. at the stationary state are controlled by the outside light intensity. The adaptation of an animal to light and the consequent changes in sensitivity are detd. entirely by the light to which it is exposed.

CHAS. H. RICHARDSON

The photochemical basis of animal heliotropism. J. H. NORTROP and JACQUES LOEB. *J. Gen. Physiol.* 5, 581-95(1923).—Expts. on the reaction of *Limulus* to light show that it responds in such a way that the product $I \times t \cos \alpha$ is identical for symmetrical photosensitive elements of the eyes or skin where I is the light intensity, t the duration of illumination and α the angle of incidence of the light at the surface of the photosensitive element. The products of decompn. by light must be the same for symmetrical elements of the eyes or skin. The influence of these decompn. products on the tension of symmetrical muscles of locomotor organs must also be the same, thus regulating the movement of the animal to and from the light. Loeb's photochem. theory of heliotropism is confirmed.

CHAS. H. RICHARDSON

Comparative studies on respiration. XXV. The action of chloroform on the oxidation of some organic acids. G. B. RAY. *J. Gen. Physiol.* 5, 611-22(1923).—The treatment of oleic, tannic, succinic, fumaric, cinnamic, hydrocinnamic acids and glycooll with H_2O_2 and $\text{Fe}_2(\text{SO}_4)_3$ led to the production of CO_2 at a rate that could be measured by the indicator method. Colloidal Ag had an effect similar to that of $\text{Fe}_2(\text{SO}_4)_3$. Pyrogallol and lecithin also gave measurable amts. of CO_2 ; maleic acid did not. With acids contg. a double bond, the rate of CO_2 production can be varied by an anesthetic (Et_2O , CHCl_3 ,

chlorethane, chloral hydrate). These acids resemble an organism in their rate of CO_2 production when influenced by an anesthetic like CHCl_3 (cf. *C. A.* 17, 1842). XXVI. The production of carbon dioxide from organic acids in relation to their iodine absorption. *Ibid* 623-7.—Oleic and cinnamic acids were mixed with H_2O_2 and $\text{Fe}_2(\text{SO}_4)_3$, as indicated above. At intervals, portions of the mixt. were run into Hanus reagent and titrated with $\text{Na}_2\text{S}_2\text{O}_4$. The results were stated in terms of the thiosulfate used in titrating I. A definite relation exists in the rate of CO_2 production and the ability of the compd. to absorb I. A more extended discussion will appear in a later paper.

CHAS. H. RICHARDSON

The effect of radioactive radiations and X-rays on enzymes. I. The effect of radiations from radium emanation on solutions of trypsin. R. G. HUSSEY AND W. R. THOMPSON. *J. Gen. Physiol.* 5, 647-59 (1923).—It is shown quant. that the amt. of trypsin decomposed by radium emanation depends on the concn. of trypsin and is proportional to the quantity of emanation (in millicuries) and to the time of irradiation in hrs. The β radiations probably produce the decompn. for which this statement holds. An equation is developed to express these relations. Qual. evidence suggests that X-rays, γ -rays and β -rays produce identical results in dil. trypsin solns.

CHAS. H. RICHARDSON

Membrane potentials in the Donnan equilibrium. D. I. HITCHCOCK. *J. Gen. Physiol.* 5, 661-3 (1923).—A reply to a criticism by Hill (*C. A.* 17, 1805) of Loeb's theory of the colloidal behavior of proteins.

C. H. R.

Valency rule and alleged Hofmeister series in the colloidal behavior of proteins. I. The action of acids. JACQUES LOEB AND M. KUNITZ. *J. Gen. Physiol.* 5, 885-91 (1923).—These expts. offer additional evidence that only the valency of the anion of an acid affects the membrane potentials, osmotic pressure, swelling, and viscosity of gelatin. The Hofmeister series does not exist when the p_H of the soln. or gel is properly measured. II. The influence of salts. *Ibid* 693-707.—The above-mentioned properties of gelatin are affected only by the anion of salts if the p_H of the soln. or gel is not altered by the salt.

CHAS. H. RICHARDSON

Nitro reductions by living bodies. N. WATERMAN AND J. KALFF. *Biochem. Z.* 135, 174-81 (1923); cf. *C. A.* 16, 2547.—The method which Lipschitz uses for following the reduction of *m*-dinitrobenzene (I) to *m*-nitrophenylhydroxylamine (II) by tissues is based on certain fallacies: (1) II, if thiophene free, gives no color. (2) II oxidizes to 3,3-dinitroazoxybenzene in air at room temp. It is therefore too unstable to lend itself to following the course of reductions by tissues. (3) The differences between cancer and normal cells which cause the yellow color of I solns. to disappear in contact with the former may be differences in the power to absorb or dissolve I rather than to differences in the chem. potentialities of the tissues.

GEORGE ERIC SIMPSON

Blood gas analysis. XII. The effect of the direct and alternating current on heterogeneous systems. H. STRAUB AND KLOTHILDE MEIER. *Biochem. Z.* 135, 224-39 (1923); cf. *C. A.* 17, 1662.—Passage of an elec. current through a soln. of hemolyzed blood or a suspension of blood corpuscle removes the elec. charge on the colloidal particles. If now the CO_2 -combining power be detd. at various tensions of CO_2 , and the results plotted, the curve is *gradual*, not *abrupt*. It does not resemble the discontinuous curves previously obtained by the authors (*C. A.* 13, 2045; 15, 385). The charges *now* resemble those reported by Michaelis (*C. A.* 16, 1254). If the charge be removed by a quite dissimilar procedure (by suspension of the corpuscles in a sugar soln.), a smooth curve is likewise obtained. The solns. act as if they contained inorg. buffers. The explanation follows: Before removal of the charge, the curve is detd., in part, by the presence of the charge at the phase boundaries. To such heterogeneous systems the law of mass action, contrary to Michaelis, is not generally applicable. Only after the charge is removed is the curve an expression of the amphoteric nature of hemoglobin. That the removed charge is on the surface of the colloidal particles, and not at the cell walls, is evident, since like curves are obtained with hemolyzed blood and blood corpuscles. Relation between chemical constitution and pepper taste (Staudinger, *et al.*) 10.

GEORGE ERIC SIMPSON

B—METHODS AND APPARATUS

STANLEY R. BENEDICT

To demonstrate protein grains. E. R. SPENCER. *Science* 57, 693 (1923).—A method is described for demonstrating protein grains in the cellular tissue of the Brazil nut.

E. J. C.

The methods of clinical detection of urobilin. E. TARANTOLA. *Biochem. terap.*

spec. 9, 364-7(1922).—In extg. the pigment with CHCl_3 (from urine) it is advisable not to add an oxidizing agent. The spectroscopic method of identification has the greatest value.

H. W. BANKS, 3rd

Electrodialysis of antidiphtheritic horse serum. RAUL WERNICKE. *Anal. asoc. quim. Argentina* 10, 309-17(1922).—The app. consists of a trough divided into 3 compartments by 2 collodion membranes. The serum is placed in the central compartment while water or a suitable weak soln. is circulated through each end compartment. Each of the latter contains a moveable electrode. A d. c. at 220 v. is passed through the app. and in a few hrs. the salts contained in the serum are reduced to less than 0.001 of the original amt. Further decrease requires a much longer time owing to the diminished cond. of the serum. The serum is dild. less by osmosis than when ordinary dialysis is employed.

L. E. GILSON

The pyridone test for the determination of blood in feces. FRITZ HIRSCHBERG. *Deut. med. Wochschr.* 49, 414-5(1923).—A portion of the feces is triturated with Me_2CO , which removes the coloring matter. The residue is freed from acetone by filtration and by blotting with filter paper. It is then mixed with 2 cc. of glacial acetic acid. The mixt. is filtered. From 10 to 15 drops of a 0.5% soln. of pyridone are superimposed upon the glacial AcOH ext. A white contact zone is always obtained and, in the presence of blood, a lilac-colored ring appears above the white zone. The test is about as delicate as the benzidine test.

MILTON HANKE

Determination of blood volume before, during, and after birth. W. NEUBAUER. *Deut. med. Wochschr.* 49, 520-1(1923).—Fifteen cc. of a 0.75% soln. of Congo red were injected into the arm vein. After 4 min. blood was withdrawn and the concn. of Congo red detd. colorimetrically in the plasma. The blood vol. was calcd. from the degree of dild. of the Congo red. During pregnancy the blood vol. is increased 0.6% above the normal value. Just before delivery the blood vol. drops to 0.33% above normal and, after delivery, to 0.6% below normal.

MILTON HANKE

The determination of nitrogen in urine and blood. F. URZ. *Deut. med. Wochschr.* 49, 485(1923).—The urine or deproteinized blood is treated with concd. H_2SO_4 and perhydrol (the latter must be free from nitrogenous stabilizers). The liquid is then heated to 100-140°, perhydrol being added from time to time as charring occurs. This is a modification of the Kjeldahl process, perhydrol being used to assist in the decompn. of the org. matter. The use of perhydrol greatly reduces the time of digestion, and the required decompn. temp. The method is described in detail. MILTON HANKE

Determination of small quantities of oxalic acid (KHOURI) 7.

C—BACTERIOLOGY

A. E. BALLS

The disinfecting action of lime water. JAN SMIT. *Chem. Weekblad* 20, 263(1923).—Adding as little as 74 mg. Ca(OH)_2 per l. kills all cholera vibrio within 30 min.

R. BEUTNER

The influence of a strain of inagglutinable Flexner bacillus on anti-Flexner bacteriophage. P. C. FIDU. *Tijdschr. Vergelijk. Geneeskunde* 8, 233-48(1923).—The bacteriol. observations support the opinion of d'Hérèlle that the protoplasm of bacteria attacked by the bacteriophage defends itself in the same way as does the animal organism against infection. A special inagglutinable Flexner is found which binds and destroys the bacteriophage in its protoplasm, but does not secrete sol. antilynsins.

R. BEUTNER

The significance of accessory food substances for bacterial growth. BRUNO LEICHTENTRITT. *Berl. klin. Wochschr.* 58, 631-4(1921); *Abstracts Bact.* 6, 104; cf. C. A. 17, 128.—Malt, lemon and carrot exts. exert a stimulating effect on the growth of bacteria, especially staphylococci and diphtheria bacilli—an effect that is not exerted by blood or ascites. Neutralized lemon juice agar was found useful as a substitute for Loeffler's serum for the diagnosis of diphtheria. It is argued on general grounds that the accessory food substances which are indispensable to man and animals are also necessary to bacteria.

H. G.

Action of the pneumococcus on aromatic amino compounds. W. J. PENFOLD. *Med. J. Australia* 2, 120-8(1922); *Australian Sci. Abstracts* 1, 27.—All pneumococci and probably all streptococci act on certain aromatic amines, notably aniline, benzidine and the toluidines, producing pigment. The pigments are probably due to the oxidation of the amino compds. by the peroxide produced by these organisms. This aniline pigment production serves to sep. the pneumococcus and streptococcus from the great majority of pathogenic organisms, and may possibly be profitably applied in field-work.

for the detection of both the aniline-pigment-forming and the aniline-non-pigment-forming bacteria. Benzidine is the best of the aromatic amines for the purposes of this test. Eighteen cc. of nutrient agar, one cc. of citrated horse blood and one cc. of 0.5% benzidine soln. constitute an excellent medium for obtaining this reaction.

H. G.

The asymmetric decomposition of glycyl-*D*-tyrosine by dead bacteria. H. T. MRO. *Acta Schol. Med.* (Tokio) 5, 27-32(1922); *Physiol. Abstracts* 7, 570; cf. *C. A.* 12, 816.—Expts. are given which show that dead bacteria (*B. coli* and *St. albus*) are able to split this dipeptide into its constituents.

H. G.

The production of carbon dioxide and volatile acids by propionic bacteria with special reference to their action in cheese. J. M. SHERMAN AND R. H. SHAW. *Sci. Proc. Am. Soc. Bacteriologists, Abstracts Bact.* 6, 16.—Observations have been made concerning the action of *Bact. acidi-propionici* (d), a causal factor in the production of eyes and the characteristic sweetish flavor of Swiss cheese, upon various substances which occur in cheese. Aside from its previously known action upon lactose and lactates, it has been found that this organism can produce CO₂, propionic acid and AcOH from succinates, glycerol, nitrogenous compds. (peptone), and perhaps, to a slight degree, from butter fat. Except in the case of peptone, the volatile acids were produced in the proportion of about two parts of propionic to one part of acetic. From peptone the proportion of AcOH to propionic was greater than from the other substances noted above; and in keeping with this fact it was observed that aspartic acid was acted upon with the production of only CO₂ and AcOH.

H. G.

The acid and alkali resistance of bacteria. A. M. HIEMMA. *Tijdschr. Diergeneesk.* (Utrecht) 48, 53-5(1921); *Abstracts Bact.* 6, 305.—When H. stained preps. with phenol-water-blue he found it impossible to decolorize with a HCl soln. in alc., even after 15-30 min. exposure. Extending his observations and using pure cultures of Gram-positive and -negative organisms, he observed them all to be acid-fast. He then studied the behavior of those organisms and that of *B. tuberculosis* with regard to certain dyes and decolorizers. He used carbolfuchsin, sublimate-eosin (Gasis) and phenol-water-blue as stains. A 3% HCl soln. in alc., and Gasis soln. (0.5 g. NaOH, 1 g. KI in 100 cc. of 55% alc.) were used as decolorizers. Results are thus tabulated.

	Carbolfuchsin.	Eosin-sublimate.	Phenol-water-blue.
<i>B. tuberculosis</i> human...	{ Acid-fast alkali-fast	Acid-fast alkali-fast	Acid-fast not alkali-fast
Other microorganisms...	{ Not acid-fast alkali-fast	Not acid-fast not alkali-fast	Acid-fast not alkali-fast

Conclusion: The term acid-fast bacilli cannot be used to differentiate them from all others. It is necessary to make a restriction and to say that a group is resistant against acids provided a certain dye is used.

H. G.

The effects of certain concentrations of hydrogen ions upon intestinal bacteria. K. SCHERR. *Z. Immunitäts. I Abt., Orig.* 33, 36-42(1921); *Abstracts Bact.* 6, 106; cf. *C. A.* 16, 3921.—This paper deals with the final p_H produced by intestinal bacteria in bouillon contg. sugar and with the H-ion concns. which kill these bacteria. The typhoid-colon-dysentery group was compared with the Gram-positive enterococci and the bifid organisms. After 3 days' growth in a broth contg. 5% lactose, with an original reaction of p_H 6.7, *B. coli* produced a final reaction of p_H 5. *B. bifidus* changed the reaction to p_H 3.7 in 2 days. The enterococci and most of the other Gram-positive organisms had a final p_H of about 4.2. The resistance of these organisms to acid showed the bactericidal action of the acid to vary with the time of exposure. In 24 hours, *B. coli* was killed in a fluid at p_H 4.7; *B. typhosus* at p_H 5. The enterococci and *B. bifidus* were killed at about p_H 2.3 to 3.7. These figures are said to be fairly characteristic of the species of organism, being a definite value in each case.

H. G.

Dissimilar nutrition as the origin of differences in susceptibility to injurious substances and altered antigenic properties of bacteria. C. E. CAHN-BRONNER. *Z. Immunitäts. I Abt., Orig.* 33, 375-430(1921); *Abstracts Bact.* 6, 105.—Comparisons were made between the properties of cultures of *B. paratyphosus* B when grown on ordinary bouillon and on a synthetic medium composed of NaCl 0.5, dipotassium phosphate 0.2, and NH₄ lactate 0.6%. Bacteria grown on the simple synthetic medium require more O for growth and are more sensitive to disinfectants or bactericidal substances than bacteria grown in bouillon. Such substances as quinine, salicylic acid, tryptoflavine, carbolic acid and HgCl₂ inhibit the growth of bacteria in the synthetic medium more strongly than in bouillon. They apparently affect the assimilation phase of bacterial

metabolism. The bacteria in the synthetic medium are inhibited at a lower temp. than those growing in broth, and they are more sensitive than the broth cultures to acid agglutination. The bacteria from the cultures in the synthetic medium are less strongly agglutinated by antisera, but their exts. are more strongly pptd. than similar antigens from cultures in broth. These serological differences, however, were not beyond the limits which differentiate one race of bacteria from another. It is obvious, however, that the bacteria from cultures in the synthetic medium are composed of somewhat different substances from those grown in broth. The effect of this synthetic medium upon bacteria grown in it is not the same as the effect produced by the "starvation media," in which the bouillon is simply poor in foodstuffs. In the "hunger strains" there is an alteration or lack of the ectoplasm of the bacteria. H. G.

Habituation experiments on bacteria with particular reference to the physico-chemical changes. C. W. JUNGEBLUT. *Klin. Wochschr.* 2, 549-50 (1923).—Cholera vibrio, typhoid bacilli and Shiga Ruhr bacili do not acquire a definite and lasting tolerance for HgCl_2 . Pneumococci acquire a considerable tolerance for optochin and streptococci for acriflavine. Streptococci do not readily acquire an increased resistance toward Rivanol. Staphylococci do not acquire a definite and lasting tolerance for methylene blue. Cholera vibrio acquire an increased resistance toward agglutinins. The agglutinin-habituated vibrios do not show an increased resistance toward the bactericidal action of the immune serum. Optochin-habituated pneumococci are more resistant only to optochin. Rivanol-habituated streptococci are as resistant to acriflavine as acriflavine-habituated organisms and vice versa. MILTON HANKE

Prevention of secondary fermentation [in lager beer] by infection with an ester-forming mold. H. CHRISTOPH. *Z. ges. Brauw.* 45, 125-7, 133-7, 139-44 (1922).—From a dark Bavarian beer exhibiting the taste and smell of bananas—resembling that of Am acetate—C. has isolated a new mold, named provisionally L 192. This organism occurs in cells of various shapes and sizes, some with 2 or 3 sharp angles, some with only one such angle, and some with re-entrant angles. In faintly acid nutrient media it develops conidia, which are formed both by direct budding and by intermediate lateral branches. In neutral or slightly alk. solns., a characteristic mycelium, sparingly branched and separated, is the principal form, the organism hence belonging to the Hyphomycetes. In its mode of growth it resembles *Chalara mycoderma*. Submerged growth in wort results in slight evolution of gas and in the formation of 0.5% of alc. in 14 days. In wort, beer, and similar faintly acid substrates it develops an intense banana-like odor. Its giant colonies are pure white and flat, and have the typical mold character, with concentric rings and radial folds. The organism is not suppressed by the primary fermentation, and in the lager vessels brings secondary fermentation to a standstill by withdrawing albumoses and minimal proportions of carbohydrates from the culture yeast and weakening this to such an extent that evolution of CO_2 is inhibited. In the case examd. the infection occurred in the wort on the coolers, and was wind-borne from a neighboring fruit store. The use of the organism in making mineral waters, fruit wine, and the like, is suggested. J. S. C. I.

Bacterial metabolism. LXVI. The estimation of small amounts of carbohydrates by bacterial procedures. A. I. KENDALL AND SHIGEYA YOSHIDA. *J. Infectious Diseases* 32, 355-61 (1923).—In general the action of microbes on utilizable carbohydrates is manifested by an increase in the H-ion concn. of the medium in which they are developing. Some bacteria produce gaseous products from sugars in addn. to the acidic changes. As changes in H-ion concn. are detectable and even measurable with a fair degree of accuracy by suitable chem. indicators, this procedure presents a method for estg. minute quantities of carbohydrates. It is shown that 0.00001 g. of levulose per cc. is the smallest amt. of this sugar that will furnish enough H-ions to change the reaction measurably under the conditions of the expt. This amt. is in general the min. and, therefore, represents approx. the limit of precision of the method. As long as sugar is present, owing to its protein-sparing nature, the H ion increases until the sugar is exhausted, then there is a return toward neutrality due to the action of protein which yields products of alk. reaction. JULIAN H. LEWIS

Germicidal qualities of sodium diiodosalicylate (diasal). W. M. CROFTON. *Lancet* 1923, I, 893-4.—Na diiodosalicylate is germicidal to *Staphylococcus aureus* in 1% concn. in 10 min. *Micrococcus catarrhalis* and various streptococci are equally sensitive. The compd. is not germicidal to *B. tuberculosis*, and may even stimulate its growth. Expts. on rabbits and man are recounted. E. R. LONG

The stability of bacterial suspensions. VI. The influence of the concentration of the suspension on the concentration of salt required to cause complete agglutination. J. H. NORTHROP. *J. Gen. Physiol.* 5, 605-9 (1923); cf. C. A. 16, 3696; 17, 587.—The

concn. of various salts required to agglutinate suspensions of *B. typhosus* sensitized with immune serum were detd. Electrolytes may be divided into 2 classes: (1) those in which the agglutinating concn. is independent of the concn. of the suspension; (2) those in which the agglutinating concn. increases with an increase in the concn. of the suspension. Salts of class 1 do not reverse the sign of charge of the suspension; those of class 2 (except ZnSO_4) do reverse it. No distinct valency effect was noted. Alkali and alkali earth ions do not combine chem. or reverse the sign of charge; the heavy metal ions and H ion reverse the sign of charge and behave as though combined chem. with the suspension.

CHAS. H. RICHARDSON

Effect of certain stimulants on the fermentative activity of yeast. MARIE J. OTTERO. *Compt. rend. soc. biol.* **88**, 375-6(1923).—0.05 mg. of pyridine and 0.00005 mg. of nicotine were found to exercise a stimulating influence on the growth of yeast.

S. MORGULUS

LÖNNIS, F. and FRED, E. B.: **Textbook of Agricultural Bacteriology.** New York: McGraw-Hill Book Co. Inc. 283 pp. \$3.

D—BOTANY

B. M. DUGGAR

Physiological study of the graft. Migration of inulin in grafted plants. H. COLIN. *Rev. vil.* **58**, 329-33(1923); cf. *C. A.* **16**, 3107.—Studies were made of the distribution of inulin in grafts of the sunflower (*Helianthus annuus*), which normally contains no inulin, and the Jerusalem artichoke (*Helianthus tuberosus*), in which inulin occurs both in the stalk and tubers. Where *H. annuus* was grafted upon *H. tuberosus* no inulin could be detected in any part of the former, while it occurred normally in the case of the latter; where *H. tuberosus* was grafted upon *H. annuus*, inulin was likewise confined to the tissues of *H. tuberosus*. This specificity of distribution is maintained even in the tissues at the junction of the 2 species.

P. R. DAWSON

Attic "Komara" (Kumara) (Fruit of the strawberry tree). EM. EMMANUEL. *Ber. pharm. Ges.* **33**, 95-6(1923).—Analysis of the ripe fruit showed: H_2O 73.408-74.487, acid (as malic) 0.744-0.974, pectins 1.814-1.863, sugar (before inversion) 10.61-11.37, sugar (after inversion) 15.71-16.11, total N 0.811-1.018, ash 0.653-1.119, alky. of ash (cc. N alkali) 2.05-4.27%.

W. O. E.

The formation of essential oils in plants. V. N. LUBIMENKO AND S. S. FICHTENHOLTZ. *Bull. inst. sci.* (St. Petersburg) **1**, 148-68(1920); *Physiol. Abstracts* **7**, 620.—The flowers of 3 species of *Mentha* contain more essential oil than the leaves, and the latter more than the stems. In *Arisema absinthium* the leaves contain as high a proportion of essential oil as the flowers. The amt. of oil in the leaves increases with age of the plant up to the beginning of flowering, then decreases up to the time of full bloom, and then again increases. Drying the leaves or flowers increases the quantity of oil in them, the yield being the same whether the drying is carried out in light or in darkness. The results suggest that the formation of essential oils in the plant is not directly connected with respiration or transformation of carbohydrates during the processes of growth, and it is therefore very doubtful whether essential oils are simply waste products.

H. G.

The resistance of wheat to the Hessian fly. A progress report. J. W. MCCOLLOCK AND S. C. SALMON. *J. Econ. Entomol.* **16**, 293-8(1923).—Resistance is due to physiological causes with which Si is associated. Other biological data are given.

C. H. R.

The composition of the cell sap of the plant in relation to the absorption of ions. D. R. HOAGLAND AND A. R. DAVIS. *J. Gen. Physiol.* **5**, 629-46(1923).—The cell sap of *Nitella clavata* has a much higher concn. of K, SO_4 , Ca, Mg, PO_4 , Cl and Na than the medium in which it lives. All or nearly all the inorg. elements exist in the ionic state. In the cell wall or protoplasm Ca, Mg, S, Si, Fe, and Al are found in an insol. or combined condition, Ca predominating. No insol. K exists. Healthy cells have a pH of 5.2, which does not change when the outside soln. varies from pH 5.0 to 9.0. The H-ion concn. influences the penetration of NO_3 ions from dil. solns. into the cell sap; penetration is more rapid from a slightly acid than from an alk. soln. Possibly NO_3 forms a combination with cell wall or protoplasm constituents. The exosmosis of Cl from the cells offers a delicate test for injury or altered permeability. Dil. solns. of NH_4 salts cause an increase in the alky. of the cell sap owing to the penetration of the NH_4 ion. This change is accompanied by injury and the exosmosis of Cl. The penetration of ions may take place from a soln. of low concn. into one of higher concn. The cell sap

has an appreciable buffer value; unknown org. anions and phosphates contribute towards this. Comparisons are made with higher plants. CHAS. H. RICHARDSON

E—NUTRITION

PHILIP B. HAWK

NORMAL

A study in the nutrition of an invertebrate, *Planaria maculata*. ROSALIND WULZEN. *Univ. of Calif. Publs. in Physiology* 5, 175-87(1923).—These worms are perceptibly sensitive to minute variations in the chem. compn. of their diet. They are good material for nutrition studies. E. J. C.

The use of dried horse chestnuts as fodder and an experiment in feeding sows and young pigs with horse chestnut sirup. J. STOLZENBERG AND F. MACH. *Deut. Landw. Presse* 48, 437; *Chem. Zentr.* 1922, III, 204.—The fodder consisted of approx. 70% horse chestnut cake and 30% sirup ext. and contd. in %: H₂O 15.27, crude protein 7.84, fat 3.19, N-free ext. 64.12, crude fiber 3.85, starch 58, digestible protein 1.6, ash 5.63. Too great an increase in sirup ext. does not agree with the animals, but 500 g. can be fed to sows and an amt. corresponding to their age to young pigs. Since the digestible protein in the chestnuts is 1.6%, small amts. of a protein-rich fodder must be added if they are to be substituted for potatoes and maize. C. C. DAVIS

The nature of court-noué. A. GAUCH AND J. DURAND. *Prog. Agr. Vitic. (Ed. l'Est-Centre)* 41, 540-3(1920); *Expt. Sta. Record* 48, 147.—Facts and views, credited to different authors, are discussed with emphasis on the suggestion, based partly on analogies which are indicated, that court-noué is an avitaminosis, or disease due to depletion or absence of essentials at least analogous to vitamins in animals. H. G.

Court-noué and vitamins. C. LEFÈVRE. *Prog. Agr. Vitic. (Ed. l'Est-Centre)* 41, 587, 588(1920).—This discussion deals with the bearings of the vegetable vitamin hypothesis set forth by Gauch and Durand above noted. H. G.

The production of atherosclerosis in rabbits by feeding diets rich in meat. L. H. NEWBURGH AND SARAH CLARKSON. *Arch. Intern. Med.* 31, 653-76(1923).—See C. A. 16, 4260. I. GREENWALD

New aspects in the vitamin problem. FRANZ GROEBBELS. *Klin. Wochschr.* 1, 1548-51(1922).—The abs. O consumption by normal mice of different ages is not markedly different, but the O consumption per g. body wt. per hr. is very different. A mouse weighing 4.05 g. used 51.6 cc. O per hr. or 1201.6 cc. per g. body wt. per day, while one weighing 13.5 g. consumed 77.8 cc. O per hr. or 531 cc. per g. body wt. per day. Mice lost 13.1% of their body wt. in 24 hrs. when starved; the abs. O consumption was reduced 31.1%. After 4 days of starvation the animals died having lost 27% in wt. The O consumption was reduced by 38%. Mice fed exclusively upon polished rice died in 13-17 days after losing about 30% of their initial body wt. On this diet there is, at first, an increased O consumption, which is then followed by a steady decrease. A max. is usually reached within 24 hrs. and is always reached within 8 days. The elevation varies from 24 to 59%. Animals that had become so weak that they were no longer able to stand up recovered rapidly and lived for 3-4 days when they were placed in an atm. of pure O. MILTON HANKE

Platelets in vitamin-A deficiency. W. CRAMER, A. H. DREW AND J. C. MOTTRAM. *Brit. J. Exptl. Pathol.* 4, 37-44(1923).—The const. occurrence of a deep thrombopenia in vitamin-A deficiency in rats has been confirmed by further observations. Cf. C. A. 16, 4216. HARRIET F. HOLMES

The chloride content of the serum of sucklings. K. SCHEER. *Jahrb. Kinderheilk* 44, 295-314(1921).—The chloride content of the serum of sucklings is fairly const., and about 0.50% to 0.59%. At the beginning of digestion, the chloride decreases quickly, and regains its former level afterwards. This connection between the serum chloride and the secretion of gastric juice is quite independent of the kind of food. Infusion of isotonic dextrose soln. effects a diminution of the serum chlorides of some hours' duration. J. C. S.

The effect produced upon the fat of hogs by feeding fish meal. J. B. MARTIN. *J. Assoc. Official Agr. Chem.* 6, 498-501(1923).—Rations, analysis of fish meal, analysis of lard from hogs fed on fish meal, and of prime steam lard are given; also the method used for prep. the fatty acids and for detg. the Br. The fat of hogs fed on fish meal is identical with normal fat in its phys. aspects and ordinary chem. characteristics. The fat of hogs fed on fish meal contains a small proportion of the glyceride of clupanodonic acid. Clupanodonic acid has been identified by the prepn. of insol. cotabromod-

stearic acid having the known properties of that substance and contg. nearly the theoretical percentage of Br.

J. A. KENNEDY

The nitrogen excretion during fasting. MARCEL LABBÉ AND FLORIDE NEPVEUX. *Compt. rend. soc. biol.* 87, 1022-4 (1922).—A study of the total urinary N was made in a subject who fasted 40 days. The av. N elimination per day before the fast was 12.36 g. In the first 3 days of absolute fasting this gradually diminished to 8.73 g., but on the 4th day it rose again to 12.01 g. but in the next 11 days declined to 7.175 g. per day. In the next 14 days the subject received small quantities of lemonade, and during this period the N elimination varied from 8.35 to 4.47 g. per day, but on leaving out the lemonade this elimination increased somewhat and varied from 8.99 to 5.18 g. These results show the relation between the N excretion and the available carbohydrate. On the av. for the entire fasting expt. the subject eliminated 0.17 g. of N per kg. of body wt. While the respiratory exchange representing the total metabolism diminished by nearly $\frac{1}{2}$, the N metabolism diminished only about $\frac{1}{4}$.

S. MORGULIS

Labor and nutrition. IV. General metabolism of several Japanese workwomen. JONOSHIN SAKAMOTO. *J. Biochem. (Japan)* 2, 73-102 (1922).—The expts. were conducted with 3 hosier workers and 1 housemaid. They were not restricted either as to the quantity of food or as to meal time. All analyses of food and excreta were performed separately every day. Special attention was given to the menstrual blood. This was collected by a special method. Each subject was supplied with cotton wool previously extd. thoroughly with alc. and ether, dried and weighed. The cotton was again weighed after it had absorbed the blood and analyzed. The amt. of blood was corrected with the figure obtained for the ordinary secretion as detd. during a few days before the onset of menses. Complete tables are given with the records of the daily menus and the quant. data pertaining to the diets used. By the observation of the daily N balance, the minimal N requirement per kg. body wt. was found for the 4 women as follows: 0.1110 g., 0.1126 g., 0.0874 g., 0.1102 g., corresponding to 0.694 g., 0.704 g., 0.546 g. and 0.689 g. protein. The labors of about 10 hrs. daily necessitated the following minimal amts. of N: 0.1555 g., 0.1558 g., 0.1278 g. corresponding to 0.972 g., 0.974 g. and 0.799 g. of protein. The slender women seemed to require less N than the obese. The protein requirement was far less in case of an entirely or nearly so vegetable diet, the difference amounting to from 8% when the animal N content was 9-12% of the total protein to 13-27% when 17-20% of the N was from animal protein. The high carbohydrate content of the vegetarian diet is thought to exercise a saving action on the protein metabolism. In the menstrual period there are the following changes in the N excretion. Beginning from the 3rd or 4th day before the commencement of menstruation the urine N tends to decrease somewhat, to about 80 or 90% of the previous days. On the day of the commencement of the flow there is a temporary increase in the urinary N but it soon diminishes again to about 90% of the first day. When the menstruation is over there is apt to follow an increase in the N of about 20%. After a lapse of 3 days after the cessation of the menses the urine N again diminished rather markedly (50-75% of the first day value) but in the course of another 3-5 days the normal value is restored. This course of the N excretion is practically followed by all N excreted either with the urine, feces, or with the menstrual blood. S. concludes that during the menstrual phase the protein metabolism is both relatively and absolutely slow but is relatively active in the post-menstrual period. During labor the amt. of menses blood is greater than during rest, and the N content is larger in the initial part of the first day and gradually is reduced in the latter part. In the menstrual and post-menstrual periods the requirement of neutral fat and lipoids is larger regardless of age. A study of the absorption rate for each foodstuff shows that in the menstrual period these are generally larger. Also moderate, but not excessive labor enhances the absorption of each food matter. From the extensive data collected the following combination of food substances has been suggested as being the most favorable physiologically: lipid 0.13-0.2%; N 8-9%; fat 1.6%; carbohydrate 77-88%. The energy requirement of these female workers is generally greater than $\frac{1}{4}$ of that of various workmen. It was considerably larger for the slender and muscular one (1446 Cal.) than for the fat one (1234 Cal.). The supplementary energy necessary to meet the increase of the unit of laboring hrs. is 1.6 to 2.2 Cal. per kg. or 49 to 72 Cal. per sq. m. of surface. With large amts. of labor this may reach 3.6 Cal. per kg. The caloric requirement in the menstrual period is smaller than in the premenstrual period, and is smallest in the post-menstrual period. Generally speaking, the larger caloric requirement comes in the intermenstrual period.

S. MORGULIS

Multiple deficiencies and avitaminosis. R. LIGCO. *Bull. sci. pharmacol.* 30, 17-23 (1923).—White rats receiving only water and vegetaline or gluten of wheat die

at least as quickly as those receiving water without any food. Sugar alone has a certain protective action which prolongs the life of the animal 10 to 15 days. A mixt. of gluten and vegetaline sustains life longer than either alone. On the other hand the addition of vegetaline diminishes the beneficial action of sugar but the addition of gluten increases the benefit of sugar. The mixt. of gluten, vegetalin and sugar was inferior from a nutritive point of view to a mixt. of gluten and sugar, showing that fat deficiencies in the food of the rat are not of great importance. Multiple deficiencies in vitamins are illustrated and discussed.

L. W. RIGGS

Passage into the milk of vitamin C introduced by the parenteral route. E. LESNÉ, CHRISOU AND VAGLIANOS. *Compt. rend.* 176, 1006-8(1923).—A pregnant guinea pig put on a diet without vitamins received each day a subcutaneous injection of 3 cc. of orange juice. After 15 days the young were born; from this time the injections were intra-peritoneal. On the 18th day when the secretion of milk had nearly ceased and the young guinea pigs had begun to show swelling and pain in the posterior parts, one pair was suckled by another female which was at the beginning of lactation and had received a scurvy-inducing ration with subcutaneous injections of vitamin C. These died of scurvy in 44 days. The other pair were suckled by their dam and received supplementary sterilized rations. These died with scurvy in 25 days. A repetition with other young guinea pigs gave the same result.

L. W. RIGGS

Vitamins contained in rice bran and some other substances. I, II and III. Y. KINUGASA AND Y. HATTORI. *J. Pharm. Soc. Japan* No. 485, 579-95; No. 486, 671-99; No. 487, 780-99(1922).—The history of discovery of vitamin B (or oryzanin), various attempts to isolate the active principle, and a review of the chem. nature and reactions are given in detail with a complete review of Japanese investigations. In II, various methods of extn. and pptn. of vitamin B from rice bran were tried and the resulting products were tested quant. for their activity with anti-polyneuritis power with pigeons, and also with Williams' method of quant. detn. with yeast. In III, various other substances were extd. and their vitamin B contents were similarly detd. The results are given in 20 tables and 11 charts. The main conclusions are: A cold H_2O extn. gives a better result with rice bran than $MeOH$. In its prepn. from the bran, use of $Pb(AcO)_2$ as a pptg. agent gives least injurious effect on the vitamin. Pptn. with baryta from $MeOH$ ext. gives the largest amt., but the H_2O -sol. fraction of this ppt. is slightly injurious to the appetite of pigeons and is an entirely different substance from the tannic acid ppt. An amorphous picrate of vitamin B, m. 222° , is prepd. from the Et_2O ppt. from the aq. ext. of the bran, which is active in as small an amt. as 0.01 g. The anti-polyneuritis principle of the vitamin is precipitable with phosphotungstic acid (in acid medium) and gives a blue color with the uric acid and the $PhOH$ reagents of Folin and Macallum. As the degree of purity increases, the intensity of the test with the uric acid reagent seems to decrease. A positive test with Folin reagents does not prove the presence of vitamin B, unless the presence of tyrosine is excluded. The diazo reaction is not sp. for this vitamin as the much purer product gives a more doubtful color test with this reagent. The result of comparison between anti-polyneuritis power (with pigeons) and Williams' yeast growth method, when applied to different preps. from the rice bran, and the same preps. for the different sources, show that although all samples of vitamin B promote growth of yeast, yet their anti-polyneuritis power does not always go in parallel with power to promote the growth of the yeast. Thus K. and H. support an idea that anti-polyneuritis power and H_2O -sol. growth-promoting principle in vitamin B are not the same substance.

S. T.

ABNORMAL

Influence of the state of acidosis on the metabolism of alkali earth metals in the organism. MICHELE FLORIS. *Arch. farm. sper.* 35, 88-103, 113-21, 129-38, 145-53, 161-6(1923).—Administration of 5 cc. of lactic acid to dogs during a 5-day period (0.89 cc. per kg.) resulted in a marked diminution of Ca and Mg in the feces, and occasionally a slight increase of Ca and Mg in the urine. With both Ca and Mg there was a marked retention by the organism. When lactic acid was given in 10 cc. doses for 4 days (1.37 cc. per kg.) both feces and urine showed increased elimination of Ca, with negative Ca balance. The Mg sometimes diminished in the feces and increased in the urine, with generally a retention by the organism. Oral administration of lactic acid has much the same effect as certain abnormal conditions of fermentation whereby org. acids are produced in the digestive tract with loss of Ca from the organism.

A. W. DOX

Experimental scurvy. I. Modern views on the etiology of scurvy. DOMENICO LIOTTA. *Arch. farm. sper.* 35, 184-91(1923).—Historical introduction. A. W. DOX

Notes on some experiences with avitaminosis. E. ABEL. *Compt. rend. soc. biol.* 87, 1213-5(1922).—Expts. were made with young chicks and ducklings which were fed on a diet previously sterilized at 125°. In the former after a while polyneuritis developed, terminating in the death of these animals, and in the latter the same treatment of the diet produced scurvy. The expts. also showed that birds which were given the sterilized diet from the time they hatched were much less resistant and developed the symptoms much sooner than those which for a time had an ordinary diet.

S. MORGULIS

Production of scurvy in the guinea pig and in the young rabbit by means of a new ration, biochemically complete and balanced, and uniquely deprived of the factor C. LOPEZ-LOMBA AND MME. RANDOIN. *Compt. rend.* 176, 1003-6(1923).—The ration consisted of white bean flour 84, granulated beer yeast 3, butter fat 4.5, Ca lactate 5, NaCl 1.5, filter paper 2 g. This ration fed to normal guinea pigs, together with 3 cc. daily of citron juice (factor C), produced a normal growth. Animals fed the same ration without the citron juice made a good growth for about 10 days, then lost wt. and died in about 30 days with the characteristic symptoms of scurvy which were confirmed by autopsies.

L. W. RIGGS

Avitaminosis B in the pigeon. J. LOPEZ-LOMBA AND MME. RANDOIN. *Compt. rend.* 176, 1249-51(1923).—Three types of ration were used: (a) decorticated seeds autoclaved or not autoclaved; (b) entire seeds autoclaved; (c) mixt. of foods destitute or deprived of the factor B. The ration preferred consisted of casein deprived of factor B 18%, peanut oil 6, rice starch 54, sucrose 4, butter fat 10, filter paper 4, mixt. of salts 4. This ration was made into cakes and cooked in an extinguished furnace, each 100 g. of the cooked food having an energy value of about 400 cal. At first the pigeons ate 38 to 40 g. of the ration but after 2 weeks it was necessary to use forced feeding to make sure that the birds received 20 g. per day, this amt. yielding a min. necessary cal. After 10 days the birds rapidly and quite steadily declined in wt. 30 to 35% and died in from 28 to 50 days from the beginning of the feeding. A control receiving the same ration to which was added daily 1 g. of granulated beer yeast, increased quite steadily about 85 g. in body wt. during 50 days. The symptoms exhibited by the pigeons lacking vitamin B are described in detail. Immediately after death the wts. of the various organs were detd. and were compared with those of the healthy control. There was a small increase in the wt. of the kidneys and a large increase (48%) in the wt. of the suprarenal capsules. The wts. of the heart, brain and lungs were but slightly affected, but there was a notable decrease in the wts. of the testicles, pancreas and thyroid. The liver and spleen decreased about 45% and the thymus almost disappeared.

L. W. RIGGS

Defective diet as a cause of sterility. DONALD MACOMBER. *J. Am. Med. Assoc.* 80, 978-80(1923).—The final report of fertility studies in the albino rat. The diets used were designed so as to permit growth but were deficient in one or more important elements. *Conclusions:* There may be great individual variation in fertility. Such variation is increased by inbreeding and by deficient diet. When the variation is great the amt. of sterility is also great. There are individuals whose fertility is so low that they are unable to reproduce with one another, but whose fertility remains sufficiently high to allow immediate and successful reproduction with highly fertile individuals. A theory is formulated which requires further exptl. study for its establishment.

L. W. RIGGS

Incidence of keratomalacia among rats suffering from avitaminosis. A. D. STAMMERS. *S. African J. Sci.* 19, 241-3(Dec. 1922).—Expts. were made with 2 series of animals, the first series consisted of 40 young and 4 adult rats which were fed fat deprived of vitamin A by steam distn. The 56 rats of the second series were fed fats of varying degrees of deficiency. In the first group 35 young animals developed keratomalacia between the 31st and 80th day of the expt. and 4 adult animals developed the condition in 104 to 129 days. Of the young rats of this series, 29 died within 101 days and 5 were apparently not affected with keratomalacia. Two of the 4 adult rats died within 150 days. Or 86.6% of this group were affected, 67% of the cases appearing before the 60th day, except with the 4 adult animals. In the second series 42.8% were affected, 67% of the cases appeared after the 60th day, only 12 out of 24 animals affected died and most of these deaths occurred among animals that received the least amt. of vitamin A in their diet.

L. W. RIGGS

F—PHYSIOLOGY

ANDREW HUNTER

The color of blood containing carbon monoxide. G. BENASSI. *Biochim. terap.*

spcr. 9, 357-63(1922).—Mixts. *in vitro* of venous blood with CO-combined blood were studied. Considerable variation in color is reported. The exact color of blood contg. CO should be stated less positively than has been the case heretofore.

H. W. BANKS, 3RD

The blood sugar content of infants. EINAR NYSTÉN. *Acta Paediatr.* 1, 79-98; *Chem. Zentr.* 1922, III, 84.—The blood sugar content of healthy infants 3.5 hrs. after nursing is 0.085-0.125% with an av. of 0.107%. During the first 5 days of life, the av. is 0.100%, and for the remaining period 0.123%. In general all values are higher than for adults (av. 0.09%). One hr. after nursing a distinct alimentary hyperglucemia is present, which disappears after 2 hrs. During severe dyspepsia the blood sugar content increases to an av. of 0.14%, during intoxication to 0.2%.

C. C. DAVIS

The importance of vitamins for the evolution of the human fetus and for the proper development of the mother. HANS ABELS. *Klin. Wochschr.* 1, 1785-7(1922).—The observations are statistical. Vitamin A is especially important.

M. H.

Endocrine disturbances by means of thallium. II. (Experiments on tadpoles.) A. BUSCHKE and BRUNO PRISER. *Klin. Wochschr.* 1, 2182-4(1922); cf. *C. A.* 17, 589, 784.—Tadpoles were grown in a nutrient medium to which thallium acetate, and in some expts. thyroid and thymus ext. had been added. Tl in concns. of 2-3 mg. per 2000 cc. retards both the growth and the metamorphosis of the tadpoles. When thymus ext. is added to the medium contg. Tl, metamorphosis occurs, though somewhat tardily; but growth is not improved. Dwarf frogs are obtained. Thyroid ext. does not compensate for any of the deleterious effects of the Tl. The results obtained with Tl salts are ascribed to the action of the Tl ion on the endocrine organs.

MILTON HANKE

Studies in the physiology of muscular exercise. IV. Blood reaction and breathing. D. P. BARR. *J. Biol. Chem.* 56, 171-82(1923); cf. *C. A.* 17, 2446.—"The reaction of arterial blood and the minute vol. of respiration have been studied simultaneously before, during, and after $3\frac{1}{2}$ min. of vigorous muscular exercise (corresponding to approx. 3,500 kg. m.). It is found that following exercise, the respiratory center is much less sensitive to changes in reaction of arterial blood than has been formerly supposed. No const. relationship between blood reaction and breathing can be demonstrated. Following exercise, there may be an increasing acidosis in the arterial blood at a time when the pulmonary ventilation is rapidly diminishing. Blood reaction can no longer be regarded as the detg. factor in the control of breathing. It is, of course, possible that blood reaction does furnish the normal stimulus to breathing and that lack of apparent relationship between reaction and respiration in these expts. and in those of others is due to changes in the sensitivity of the respiratory center under varying conditions. If this be true, it is apparent that there must be many influences which modify or even obliterate the effect of the normal stimulus. Of these, Et_2O anesthesia, exercise, properly controlled alkali injections, low O_2 tension, and CO poisoning are examples."

A. P. LOTHROP

Chemical factors in fatigue. II. Further changes in some of the blood constituents following strenuous muscular exercise. N. W. RAKESTRAW. *J. Biol. Chem.* 56, 121-4(1923); cf. *C. A.* 15, 3869.—"Detns. of the following constituents were made in the blood of 9 men before and after a short period of strenuous muscular exercise (running rapidly up and down stairs for 10 min. or until almost completely exhausted): uric acid, sugar, amino acids, chlorides, and free and conjugated phenols. Samples were taken at intervals up to $1\frac{1}{2}$ hrs. following the exercise. Uric acid was found to increase continuously over the period of observation; sugar increased immediately following the exercise but fell below normal at the end of $1\frac{1}{2}$ hrs. None of the other constituents altered significantly with the possible exception of a slight increase in chlorides immediately following the exercise."

A. P. LOTHROP

Chemical constituents of saliva as indices of glandular activity. J. L. MORRIS and VERNON JERSKY. *J. Biol. Chem.* 56, 31-42(1923).—Extensive data are presented for the urea, NH_3 , amino acids, creatinine, and uric acid content of saliva, in many cases collected during long intervals (up to 12 hrs.) and analyzed in half hr. specimens. The samples from the resting glands were obtained by placing a 1 in. funnel behind the lips and against the teeth and allowing the secretion to flow into a cylinder while refraining from chewing and swallowing with the head bent slightly forward. The activity of the quiescent glands increases during the day, the increase being an index of the physiol. activity involved. $\text{NH}_3\text{-N}$ values are noticeably less regular than the other substances and NH_3 is probably not a direct product of the glands but is formed after the secretion leaves the glands, probably through hydrolysis of urea. Stimulation

of the glands by chewing paraffin, the presence of AcOH in the mouth, and ingestion of pilocarpine caused the following % increases, resp.: vol., 429, 560, 502; amino N, 722, 302, 249; urea + $\text{NH}_3\text{-N}$, 374, 200, 445; creatinine, 118, 124, 171; uric acid, 63, 71, 183. It is evident that when the secretion is to be analyzed quant. saliva should not be obtained by paraffin stimulation. When the effects of paraffin and AcOH stimulation are compared, it seems likely that the two stimuli act upon different parts of the secretory mechanism, the AcOH acting more locally upon the glands and the chewing exerting a general accelerating effect upon the entire process of filtration from the blood. In the case of pilocarpine stimulation a different effect again is noticed and the larger amt. of uric acid seemingly results from some stimulating effect of the pilocarpine on the glandular mechanism which differs from its action upon the vol. of liquid produced. Extremes in diet produced no definite changes in vol. or uric acid content and conditions of increased uric acid elimination through the kidneys are not duplicated in the filtration of uric acid through the salivary glands. "The data seem to justify the working hypothesis that uric acid, more than any other constituent, represents the actual cellular activity and might well serve as an index of the gland metabolism."

A. P. LOTHROP

The phosphorus compounds in normal blood. MARY V. BUELL. *J. Biol. Chem.* 56, 97-107(1923).—In normal dog blood inorg. phosphates are confined to the plasma and org. phosphates to the corpuscles. In 79 specimens of plasma from 10 dogs the inorg. phosphates averaged 14.4 mg. of H_3PO_4 per 100 cc. of plasma (extreme variations 33.5 to 11.6 mg.). Occasional traces of inorg. phosphate found in the corpuscles and of org. phosphate in plasma are apparently due to postmortem changes. The same relations exist during the height of digestion and in the postabsorptive state. Values as low as 1.5 mg. of H_3PO_4 per 100 cc. of corpuscles were found for the inorg. phosphate content of human corpuscles as compared with Bloor's av. figures of 18.7 mg. for men and 15.7 mg. for women. The small amts. of inorg. phosphates found in human corpuscles, taken together with the established ease of decompn. of the org. phosphate of the corpuscles, suggest that in the living organism there is no inorg. phosphate in human corpuscles and that the small amts. found represent postmortem changes. This point of view is not in keeping with the statement that the concn. of inorg. phosphate of serum and of whole blood in fresh specimens is identical (cf. Zucker and Gutman, *C. A.* 17, 1989).

A. P. LOTHROP

Proof that a high protein diet increases and starvation decreases the catalase content of the entire animal. W. E. BURGE. *Am. J. Physiol.* 63, 545-7(1923); cf. *C. A.* 16, 2889.—Four lots of mice were fed as follows: (1) mixed seeds and water; (2) cheese and water; (3) bacon, boiled potatoes and water; and (4) water alone. Representative animals were killed after 5, 10, 15 and 20 days, skinned and the carcasses ground, from which samples were taken for detns. of catalase. Catalase per g. material increased on the cheese (high protein) diet, decreased on the bacon and potato (low protein) diet and during starvation and remained approx. unchanged on the mixed seeds diet. This result is thought to be in line with the fact that a high protein diet increases metabolism.

J. F. LYMAN

The relation of blood volume to tissue nutrition. V. The effects of changes in blood volume elicited by hemorrhage and the intravenous injection of gum-saline solution on the total oxygen consumption of the anesthetized dog. ROBERT GESRELL, FREDERICK FOOTE AND C. S. CAPP. *Am. J. Physiol.* 63, 32-59(1922); cf. *C. A.* 17, 1989.—Rate of O_2 consumption by dogs under anesthesia was recorded by means of a Henderson rebreathing app., fitted with a cartridge of soda-lime, in which the CO_2 of the expired air was absorbed. In general hemorrhage decreased the rate of O_2 consumption and subsequent injection of gum-saline soln. increased it. It is believed that the decreased O_2 consumption following hemorrhage is linked with a decreased supply of O_2 to the tissues entailed by a decrease in the vol. flow of blood.

J. F. LYMAN

The metabolism of the salivary glands. III. The blood sugar metabolism of the submaxillary gland. G. V. ANREP AND R. K. CANNAN. *J. Physiol.* 57, 1-6(1922); cf. *C. A.* 16, 2898.—Changes in rate of blood flow (by mech. interference with the circulation) through the resting submaxillary gland had no appreciable effect on the rate of consumption of dextrose by the gland. Stimulation by the chorda tympani increased dextrose consumption 1.41 mg. per 1 cc. of saliva produced, which agrees closely with the value of 1.5 mg. dextrose per 1 cc. of saliva found when pilocarpine is used to stimulate the gland (*C. A.* 17, 2898). The max. consumption of dextrose corresponds with the max. secretion and does not occur, as does O_2 consumption, in the post-active period. **IV. The metabolism of the reducing substance of the submaxillary gland.** G. V. ANREP. *Ibid.* 57, 7-13(1922).—In the detn. of reducing sugar in acid hydrolysates of salivary glands the use of charcoal (nurite) is advised for the removal of products that interfere with the pptn. of Cu_2O . The dextrose consumed by the salivary gland

during activity does not appear in the saliva as such, nor bound as glucoprotein. The salivary gland loses the same amt. of reducing substance as is secreted in the saliva; hence there is evidence that no reconstruction of mucin takes place during secretion under chorda stimulation. J. F. LYMAN

The effects on the circulation and respiration of an increase in the carbon dioxide content of the blood in man. E. C. SCHNEIDER AND DOROTHY TRUESDELL. *Am. J. Physiol.* 63, 155-75(1922).—A gradual increase in CO_2 of the inspired air was produced in 2 types of expts: (1) the subject rebreathed atm. air from a Henderson rebreathing app.; (2) the O_2 content of the inspired air was maintained at about 30% by vol. while the CO_2 increased in the rebreathing app. The physiol. effects are: (1) The pulse rate accelerated usually at about 5% CO_2 . (2) The systolic, diastolic and pulse arterial blood pressures always increased, ordinarily beginning to rise at between 2 and 4% CO_2 . (3) The capillary blood pressure rises steadily as CO_2 increases. (4) Venous blood pressure always rises and begins to do so as early as 1% CO_2 . (5) Hand vol. increased up to about 3% CO_2 followed by a gradual decrease to below normal. (6) Blood flow through the hand decreased as CO_2 increased, while the min. vol. from the heart was not materially altered. (7) The min. vol. of breathing increased gradually and smoothly from the very beginning of the expt. The vol. per breath usually increased as early as the min. vol. (8) Frequency usually increased later than depth of breathing, but has accelerated in 60% of all expts. before 4% of CO_2 was reached. J. F. LYMAN

The influence of parathyroidectomy on gastric secretion. S. C. PEACOCK AND L. R. DRAGSTEDT. *Am. J. Physiol.* 64, 499-502(1923).—Complete removal of the thyroid and parathyroid glands in dogs had no appreciable influence on the amt. or acidity of the gastric juice collected from Pavlov accessory pouches when tetany or depression was prevented by dietary control. J. F. LYMAN

The thyroid apparatus. X. The refractive index and water content of the blood serum of male and female albino rats thyroparathyroidectomized and parathyroidectomized at 100 days of age. F. S. HAMMETT. *Am. J. Physiol.* 64, 467-80(1923).—There is no sex difference in H_2O content or nature or distribution of the refractive substances of the serum in normal rats 150 days old. The loss of the parathyroids by sexually mature male or female rats 100 days of age causes no alteration in the % of solids of the blood serum which appears when the animals are 150 days old. This loss does cause a change in the nature or the distribution of the refractive substances aside from the solvent H_2O , approx. alike in the two sexes. The loss of the thyroids causes a decrease in the H_2O content and an increase in % of the serum which is apparent in the male but counterbalanced in the female by the state of partial inanition produced. This is supportive evidence that the thyroid is concerned in the fluid exchange of the body. J. F. LYMAN

The concentration of the blood and the effects of histamine on adrenal insufficiency. C. H. KELLAWAY AND S. J. COWELL. *J. Physiol.* 57, 82-99(1922).—Ra emanation was used to destroy the adrenal medulla and a small Pacquelin cautery to destroy the cortex in cats. The amt. of medulla remaining was detd. by the degree of paradoxical pupil dilatation produced by anoxemia and by injecting histamine, and was checked by post-mortem examn. of the glands. The concn. of the blood in adrenal insufficiency is dependent on cortical defect. The concn. of the blood following the injection of small doses of histamine in animals with adrenal insufficiency is due to medullary and not to cortical defect. Deficiency of the cortex, as well as medullary defect, plays an important part in the hypersensitiveness to histamine of animals with adrenal insufficiency. J. F. LYMAN

Absorption from the intestine and excretion through the kidney of an unaltered complex protein substance, tissue fibrinogen. C. A. MILLS, S. E. DORST, GEORGE MYNCHENBERG AND JOSEPH NAKAYAMA. *Am. J. Physiol.* 63, 484-98(1923).—Tissue fibrinogen (C. A. 15, 2304) placed in intestinal loops in dogs can later be detected in the blood and urine by means of the more rapid clotting of the shed blood. Taken *per os* by man, the stomach being empty, absorption may be extremely rapid. In one expt. there was a marked acceleration of the clotting of the finger blood within 2.5 mins. after swallowing the tissue fibrinogen. The authors raise the question: "Are we justified in thinking that our foodstuffs must be reduced to amino acids, monosaccharides, etc., before absorption, in the light of these expts." J. F. LYMAN

Circulation after cessation of work with some remarks on the calculation of circulation rate experiments according to the nitrous oxide method. J. LINDHARD. *J. Physiol.* 57, 17-30(1922).—The rate of circulation through the heart after periods of work was calcd. in 2 subjects by the N_2O method of Krogh and Lindhard. The circulation rate decreases rapidly during the first 2 minutes of rest and then more slowly

following a rather complicated curve. The calcn. of the circulation rate according to the N_2O method is simplified. J. F. LYMAN

The influence of temporary closure of the renal artery on the amount and composition of the urine. E. K. MARSHALL, JR. AND MARIAN M. CRANE. *Am. J. Physiol.* **64**, 387-403(1923).—A cessation of the blood flow through the kidney for a short period (1 to 3 min.) produces no effect on the excretion of the kidney when the circulation is reestablished, except the appearance of protein in the urine. Anemia of longer duration (20 to 25 min.) produced definite changes in the urine as follows: The elimination of H_2O , Cl and HCO_3 is unchanged or may be increased, while that of urea, P_2O_5 , SO_4 , creatinine and NH_3 is distinctly decreased. The bearing of these facts on theories of urinary secretion is discussed. J. F. LYMAN

Respiration and circulation in the cat. II. The oxygen in the venous blood. K. UYENO AND Y. DOI. *J. Physiol.* **57**, 14-6(1922).—In the cat under urethan the % satn. of the venous blood with O_2 varies greatly in any given vein and bears no uniform relation to the blood in the right ventricle. J. F. LYMAN

Studies of the thyroid apparatus. XI. Effect of thyroparathyroidectomy on reproduction in the albino rat. F. S. HAMMETT. *J. Metabolic Research* **2**, 417-27(1922).—"Disturbances following the loss of, or a deficiency in, the thyroid function are the result of the general lowering of the anabolic level of the organism, due to the lack of the sp. stimulus to metabolism supplied by the thyroid, which results in a condition of partial inanition." W. A. PERLZWEIG

Influence of the glands of internal secretion upon the respiratory exchange. VII. The possible influence of suprarenal involution on heat production. DAVID MARINE, BLANCHE H. LOWE AND ANNA CIPRA. *J. Metabolic Research* **2**, 329-39(1922); cf. *C. A.* **17**, 134.—"The Haldane open circuit app. (*C. A.* **17**, 575) may be used for accurately measuring the respiratory exchange in new-born infants. The av. daily production for a given normal baby remains fairly const. from the 2nd to the 8th day of life. During the 2nd week of life there is a rise in heat production associated often with other signs of increased tissue activity. It is suggested that the rise in heat production beginning in the 2nd week of life may be related in some way to the normal destruction of the reticular and fascicular layers of the suprarenal cortex, which also begin at this time. W. A. PERLZWEIG

The effect of splenectomy upon the respiratory exchange in rabbits. DAVID MARINE AND E. J. BAUMANN. *J. Metabolic Research* **2**, 341-6(1922).—"Uncomplicated splenectomy caused a significant rise in heat production in 4 of 14 rabbits or 29%. The authors do not feel justified in assuming an antagonistic action of the thyroid and spleen." W. A. PERLZWEIG

Does cyanic acid exist in the blood? MAURICE NICLOUX AND GEORGES WELTER. *Compt. rend.* **174**, 1733-5(1922); cf. Fosse, *C. A.* **15**, 2287.—A soln. of $KCNO$, 1 to 1000, added to a satd. soln. of NH_4Cl and the mixt. maintained at 35° gives 36% of the possible yield of urea in 12 hrs., and 77% in 48 hrs. $KCNO$ alone gave no urea. Ten parts of plasma of dog blood mixed with 1 part of satd. NH_4Cl soln. and incubated 36 hrs. at 35° showed an increase of about 5% in the urea content over that of the initial plasma. By adding 0.1 mg. $KCNO$ to 1 cc. of plasma- NH_4Cl mixt. the increase of urea in 36 hrs. was 21.0%. Cyanates, therefore, occur in blood. Similar expts. with lymph proved the absence of cyanates in that fluid. L. W. RIGGS

Relation between the ligature of the ductus thoracicus and the tolerance of carbohydrate. TOSHIO OHARA. *Tohoku J. Exptl. Med.* **3**, 163-76(1922).—The ligation of the thoracic duct in dogs was performed under morphine-ether narcosis. Sugar soln. was given by stomach tube. Sugar in urine was estd. by the Pavy-Kumagawa-Sato method, and in the blood by Bang's micromethod. All anticipated factors capable of modifying the sugar tolerance of the animals were carefully avoided. The tolerance for dextrose, galactose and lactose was detd. in normal dogs and for the same no. of duct-ligated dogs. The results from 18 dogs can be divided into 3 classes: (1) dogs which showed both glucosuria and hyperglucemia of much higher degree after ligation than before, (2) those showing a hyperglucemia slightly above normal, and (3) those which showed no increase over normal dogs. The results with galactose and lactose were quite parallel to those with glucose. It may be concluded indirectly that a part of the internal secretion of the pancreas is poured out with the thoracic lymph through the thoracic duct into the blood and that glucosuria was due to want of chyle. L. W. RIGGS

Experimental studies of the inner secretion of the pancreas. II. Carbohydrate metabolism by dogs with the Eck fistula. TORU OKA. *Tohoku J. Exptl. Med.* **3**, 206-24(1922).—According to T. Kumagai and S. Osato (cf. *C. A.* **15**, 885) at least a part of the pancreatic secretion passes into the blood through the thoracic duct. The

limits of sugar tolerance as shown by the appearance of sugar in the urine, in g. per kg. of body wt. for normal dogs were glucose 7.0, levulose 1.5, sucrose 3.5 to 4.0, lactose 0.7 to 0.75, galactose 0.1. For dogs with Eck fistula the corresponding wts. for the resp. sugars were 5.0, 0.4, 0.8, 0.7 to 0.75, 0.1. The liver plays an important role in the utilization of levulose, sucrose, and in company with other organs of glucose but appears to have little influence upon the utilization of lactose or galactose.

L. W. RIGGS

Endocrinology and Metabolism. Edited by L. F. BARKER, *et al.* 5 vols. New York and London: D. Appleton & Co. Vol. I, 982 pp.; Vol. II, 995 pp.; Vol. III, 956 pp.; Vol. IV, 958 pp.; Vol. V, 879 pp.

G—PATHOLOGY

H. GIDEON WELLS

Experimental investigations on immunity against tuberculosis. C. H. H. SPRONCK. *Nederland. Tijdschr. Geneeskunde* 67, I, 1505-16(1923).—The subdermal injection of a sterile ext. of tuberculous tissue produces—in a non-tuberculous guinea pig—the same hypersensitiveness of the skin for tuberculin as is exhibited by tuberculous animals. The tuberculous tissues, therefore, must contain a product not found in *in vitro* cultures so far. The injecting into the abdominal cavity of a pulp of tuberculous organs produces an acute inflammation. Similar poisonous properties are acquired by the blood serum *in vivo* in such cases in which the tuberculous infection has progressed very far.

R. BEUTNER

Isohemagglutinins in cancer patients. C. P. H. WASSINK VAN RAAMSDONK AND W. F. WASSINK. *Nederland. Tijdschr. Geneeskunde* 67, I, 2011-4(1923).—According to Landsteiner (*Wein. klin. Wochschr.* 14, 1182(1901)) all humans can be classified into 4 groups according to the mutual agglutination of their blood; cancer patients are distributed in these 4 groups according to the same ratio as normals.

R. BEUTNER

Fatty acids in the treatment of diseases caused by acid-fast germ. P. GANGULI. *J. Proc. Asiatic Soc. Bengal, 8th Indian Sci. Cong.* 17, 124-5(1922).—Fatty acids are superior to Tuberculin T. A. since they produce tox-immunity and bacterio-immunity, whereas the latter produces only tox-immunity. But in an infection of supersensitive type, fatty acid treatment should be preceded by that with Tuberculin T. A. Fatty acids are best when tox-immunity has been produced in active cases. To attain high ideal immunity, fatty acid treatment should always be followed by that with bacillary substances.

C. C. DAVIS

The sugar in the cerebrospinal fluid. I. INO. *Acta Schol. Med. (Kyoto)* 3, 609-65(1920); *Physiol. Abstracts* 7, 536.—An attempt is made to det. the cause of the absence of sugar in the cerebrospinal fluid in meningitis. When sugars are injected into the blood stream of healthy animals, the sugar content of the cerebrospinal fluid rises, reaching its max. in an hr., then falls and becomes normal after 4 hrs. The rise appears a little later than in the blood, but disappears after the hyperglucemia has subsided. Any deficiency in the sugar content of the cerebrospinal fluid is immediately made good from the blood stream. Animals in ill condition have less sugar in both blood and cerebrospinal fluid, but otherwise show a similar dependence of the sugar level of the cerebrospinal fluid on that of the blood. Both bacteria and pus cells possess a varying degree of glucolytic action, but as the fluid frequently contains no bacteria and only a few cells they cannot be wholly responsible. The meninges and the choroid plexus, however, are capable of furnishing a glucolytic agent, and their action must account for the disappearance of the sugar before and after death.

H. G.

Nature of the syphilitic reaction and the principal cause of error in the Wassermann reaction. N. PIETRAVALLE. *Ann. ig.* 32, 651-77(1922); *Physiol. Abstracts* 7, 567.—Ca is remarkably increased in syphilitic sera giving a positive Wassermann test, and transforms the Wassermann test of sera to which it was added in minimal quantities from negative into positive. Sera rendered positive by the addn. of Ca react positively also to other tests for syphilis. In the cerebrospinal fluid of syphilitics Ca is also increased. The fact that the Ca content of the blood serum is increased in certain other conditions explains the positive Wassermann test sometimes obtained from non-syphilitic sera. The addn. of minute quantities of Ca to blood sera creates a condition favorable to the pptn. of their colloids. These actually ppt. in the presence of those colloids of the antigen which are sensitive to the action of Ca. The pptn. of the colloids of the antigen and the serum reduces the acidity of the mixt., which thus no longer possesses the acidity necessary for hemolysis. This explains why certain syphilitic sera no longer give a positive Wassermann test after inactivation. In fact, warming at 37° for half

an hr. may render them alk., and diluted sera warmed at 70° have a strong alk. reaction. On the other hand, excessive acidity of the serum may also alter the results of the Wassermann test. Sera should be, therefore, neutralized before testing them, and only tubes of neutral glass should be used for carrying out the test.

H. G.

Results of the Wassermann reaction and the precipitation tests of Sachs-Georgi (incubator method) and of Meinicke, third modification. W. WEISBACH. *Deut. med. Wochschr.* 47, 620-1(1921); *Abstracts Bact.* 6, 207.—A comparison was made in 1500 cases, and agreement was found among the 3 tests in 83.2% of the cases. The flocculation tests appear earlier than the Wassermann reaction in syphilitic disease, and remain positive longer in cases receiving treatment. They are also positive more frequently in latent syphilis.

H. G.

Lipids, and the problem of the pseudo-negative Wassermann reaction. G. PERITZ. *Deut. med. Wochschr.* 47, 859-60(1921); *Abstracts Bact.* 6, 208.—There are a large no. of lecithinemas: (a) in chronic psychoses and in epilepsy, (b) in infectious diseases like diphtheria and tuberculosis, (c) in diabetes and nephritis, (d) in narcosis, and (e) in syphilis. The origin of the lecithinemia may be imagined to occur in the following manner. Lipophilic substances become adsorbed to lipoids of the cell membrane, and then the combination becomes detached from the membrane because of change in hydration. Except in syphilis, there is no lipoidemia in which an antibody is formed against organ lipoids; and in syphilis this organ lipid must contain another substance, perhaps a syphilotoxin, against which the antibody is formed. In the Wassermann, Sachs-Georgi and Meinicke reactions the antibodies detd. are those that are free and not bound to lipid. If free antibodies are absent, and only those combined with lipid are present then the serum will yield a falsely negative reaction—a "pseudo-negative" reaction. Should it become possible, as Wassermann claims, to split up the combination of lipid and antibody, the pseudo-negative reaction will become positive.

H. G.

New results with an improved and further simplified mastic reaction. WALTHER GOEBEL. *Munch. med. Wochschr.* 68, 943-4(1921); *Abstracts Bact.* 6, 256.—The Jakobsthal-Kafka procedure is extended by the addn. of a 1:2 diln. of the spinal fluid. This permits a differentiation of fluids of general paralysis from cerebral syphilis. The concn. of NaCl and the reaction were kept uniform in the tests, and the results were thereby made more satisfactory.

H. G.

Regular changes in the blood lipid content after injections of foreign substances in so-called stimulative therapy. ERICH GRABBE. *Munch. med. Wochschr.* 68, 1377-80(1921); *Abstracts Bact.* 6, 436.—Fluctuations in blood lipid content occur regularly after injection of collargol, caseosan, hypertonic NaCl, glucose, sucrose, argochrome and horse serum. Phosphatides are apparently involved as well as cholesterol. Small doses which cause insignificant temp. reactions produce increase in blood lipoids for several hrs.; larger doses cause an early decrease and then an increase above the original concn. A simple serum layer test with 5% glycerol is described in which globulin pptn. permits observation of the blood lipid changes. This test may be useful in controlling the effect and dosage in non-specific therapy.

H. G.

The danger of anaphylaxis in protein therapy. E. GILDEMEISTER and W. SEIFFERT. *Berl. klin. Wochschr.* 58, 629-31(1921); *Abstracts Bact.* 6, 152.—Deutero-albumoses, aolan and caseosan which are recommended and often used in non-sp. protein therapy possess anaphylactogenic properties like boiled milk. This was proved by expts. on rabbits and guinea pigs, and confirms the occasional human case reported in practice.

H. G.

Measuring complement for the Wassermann reaction. W. GAERTGENS. *Berl. klin. Wochschr.* 58, 847-50(1921); *Abstracts Bact.* 6, 145.—Kaup's procedure in detg. the minimum amt. of complement necessary for the Wassermann reaction is theoretically unsound because there is no strict regularity in the protective power of serum upon antigen. An unobjectionable detn. of the minimal complement demand of each serum must be made upon a mixt. of serum and indifferent control fluid which develops the anti-complementary effect but not the sp. antigenic binding power. Such an indifferent control fluid was found in 0.1% alc. cholesterol soln. diluted 25 to 30 times. By the application of this preliminary procedure the positive Wassermanns were increased 10%.

H. G.

Mechanism of the action of tuberculin and mallein in tuberculosis and glanders. GUIDO FINZI. *Clin. vet. (Milano)* 44, 605-17(1921); *Abstracts Bact.* 6, 381.—Neither the tuberculin reaction nor the mallein reaction is due only to the formation of sp. antibodies by the animal body, but also to a form of sensitiveness peculiar to these diseases. Tuberculin and mallein are to be considered as substances contg. a special

toxin which, in contact with the tissues of an animal infected with tuberculosis or glanders, forms a sp. poison for the infected individual. The reactions to tuberculin and mallein are, then, not due to anaphylaxis, as many authors are inclined to believe. Antibodies commonly pass from a mother infected with tuberculosis, or glanders, to her offspring, and may be demonstrated in the blood of the young animals by the agglutination test or the complement-fixation test, but these animals do not react in any way to tuberculin or mallein. H. G.

Lipoid antibodies and the Wassermann reaction. HANS MUCH AND HANS SCHMIDT. *Deut. med. Wochschr.* 47, 552-3(1921); *Abstracts Bact.* 6, 145.—Recent contributions to the literature of lipid antigens furnish additional support to the "partigen laws" of Much. The recent observations of Wassermann are confirmed. The following was also detd.: If a Wassermann-negative rabbit is injected intravenously with 2 cc. of 1:10,000 Much's tubercle bacillus lipid partigen, the Wassermann reaction becomes positive with 0.1 cc. in 4 hrs., and with 0.05 cc. in 24 hrs. After 48 hrs., the reaction again becomes negative. Intravenous injection of 3 cc. of 1:500 leucine soln. causes within 4 hrs. a strongly positive Wassermann reaction with tendency to anticomplementary reaction; and after 48 hrs. the reaction was still positive though weaker than at 24 hrs. In the Wassermann-positive rabbit, injection of 0.5 cc. and later 1 cc. of a 1:1,000 saline soln. of $HgCl_2$ causes a temporarily strong positive reaction with auto-inhibition, but after 3 days it is weakly positive, and negative after further injection of 1 cc. If a rabbit with a weakly positive Wassermann reaction be injected simultaneously with leucine and $HgCl_2$ the reaction changes and remains negative. H. G.

Two methods recommended for the conservation of complement for the Wassermann reaction. KARL KLEIN. *Münch. med. Wochschr.* 68, 1453-4(1921); *Abstracts Bact.* 6, 430.—Complement preserved with NaOAc remains satisfactory for the first week, and after that considerable change occurs rapidly. This may be due to bacterial decompn. Freezing of complement is effective as a preservative, but the maintenance of uniformly low temps. is attended with difficulty. The only reliable method is the use of freshly prepd. complement. H. G.

Simultaneous Sachs-Georgi-Meinicke reaction. CARL STERN. *Münch. med. Wochschr.* 68, 1580(1921); *Abstracts Bact.* 6, 432.—Both reactions seem to be satisfactorily performed in one tube. 0.2 cc. serum is placed in the test-tube and 0.8 cc. of a 2% NaCl soln. is added. The tube is shaken. Next, 0.5 cc. of antigen mixt. is added. The mixt. consists of 0.5 cc. cholesterol ext. plus 0.5 cc. of Meinicke ext. and diluted gradually with 5.0 cc. of distd. water. The tube is well shaken and incubated for 2 hrs., and then allowed to stand at room temp. for 18 hrs. longer before reading is made. H. G.

Positive Wassermann reaction in typhus fever. KARL BAUER. *Münch. med. Wochschr.* 68, 1251-2(1921); *Abstracts Bact.* 6, 379.—The Wassermann reaction performed on inactivated serum from typhus fever is almost always positive when blood is removed before crisis. The reaction disappears again on recovery. This fact might be utilized diagnostically to differentiate typhus from typhoid fever when it is impossible to perform the Weil-Felix reaction. H. G.

Sachs-Georgi flocculation reaction and the diagnosis of syphilis. J. WOLF. *Schweiz. med. Wochschr.* 1922, No. 5, 118-21; *Abstracts Bact.* 6, 255.—The results of other workers are tabulated and followed by a discussion of the results obtained by W. in examg. 4297 sera. In this series the Sachs-Georgi and Wassermann reactions agreed in over 90% of the cases, the Sachs-Georgi being the more sensitive. The flocculation test is not strictly sp., positive findings being encountered in tuberculous patients, as well as in 100% of the cases of rheumatic polyarthrits (28 cases). Positive results were also obtained in cardiac conditions of rheumatic origin. H. G.

Theoretical and practical consequences of the flocculation reactions of Meinicke. W. JANTZEN. *Z. Immunitäts. Abt. I, Orig.* 33, 158-77(1921); *Abstracts Bact.* 6, 148.—The third modification (DM) of the Meinicke reaction was compared with the Wassermann reaction on a no. of sera. Its results show that while this reaction does not supplant the Wassermann reaction, it can be used profitably in the serological diagnosis of syphilis. It is sometimes positive when the Wassermann reaction is negative. The mixts. of serum and alc. ext. of beef heart were incubated for 24 hrs. at 37° and for 24 hrs. at room temp. This period of 48 hrs. for the incubation of the tests was found to give the best results. Fresh sera were found to be somewhat more sensitive than inactivated sera. The original Meinicke often gave non-sp. reactions, and because of the difficulty of performing it has no advantages. The DM reaction gave satisfactory results with the sera of rabbits experimentally infected with syphilis. J. thinks that the flocculation reactions and the Wassermann reaction have the same basis, and looks to colloid chemistry for the final explanation. H. G.

Relationship of albumin and globulin in the serological diagnosis of syphilis. H. SAHLMANN. *Z. Immunitäts. Abt. I, Orig.* 33, 130-56(1921); *Abstracts Bact.* 6, 147-8.—By splitting syphilitic serum with dil. HCl both the albumin and globulin fractions cause pptn. with the Sachs-Georgi reaction. On the other hand, if the serum is treated with CO₂, the actively pptg. substances remain in the albumin fraction while the globulins frequently cause no pptn. and contain something antagonistic to pptn. Globulins from both positive and negative sera, obtained in this way by CO₂, act antagonistically to the pptn. The substance inhibiting pptn. is thermolabile, being destroyed by heating at 55° for a half hr. It acts, therefore, like a protective colloid. HCl seems to stabilize this substance, as the globulin obtained with HCl gives positive Sachs-Georgi reactions. In large quantities, this globulin fraction may give non-specific reactions. The Wassermann reaction and Sachs-Georgi reaction depend essentially upon the same properties of the syphilitic serum. Differences are due to secondary factors. The globulin fraction, when composed of both the easily precipitable euglobulin and the pseudoglobulin, carries most of the active substances which cause pptn. in the Sachs-Georgi reaction.

H. G.

Hemolysin. I. The resistance of bound antibodies to heat. F. v. GUTFELD. *Z. Immunitäts. Abt. I, Orig.* 33, 197-207(1921); *Abstracts Bact.* 6, 207-8.—Friedberger and his collaborators have stated that antigens anchored to their antibodies are resistant to heat. This paper reports a reinvestigation of that subject, using the heterogenetic antisheep cell amboceptor produced by immunizing rabbits to the ext. of the guinea pig kidney. This amboceptor was chosen because the antigen, horse or guinea pig kidney is thermostable. The antiserum to these organs, however, is more susceptible to change by heat. Heating the organ-antiserum for 5 min. at 70° destroyed its hemolytic function. The method used was Friedberger's method of satg. the cells with amboceptor, heating the complex at 70° for 10 min. and then testing to det. whether the cells are capable of absorbing any additional amboceptor. The anchored heterogenetic amboceptor was no more thermostable than the free amboceptor, as it was readily destroyed by heat at 70°. The effect of heat upon the bound antibody was to destroy both the cytophile and complementophile groups of the amboceptor. On pages 292-296 are Friedberger's criticisms of these experiments and Gutfeld's replies. Friedberger objects to them because he found it impossible to sat. antigen with its antibody by one treatment as Gutfeld seems to have done. Gutfeld replies to theoretical criticisms by restating his protocols. **II. The solubility of heterophile receptors.** *Ibid.* *Z. Immunitäts. Abt. I, Orig.* 33, 461-6(1922); *Abstracts Bact.* 6, 378.—The heterophile receptors from organs of the heterogenetic type can be extd. with various solvents. Solns. of fractions of such organs in HCl, NaOH and alc. contain these receptors, which can be demonstrated by the unions which they form with heterogenetic antibodies. These unions are specific. They do not take place with the immune antisheep cell amboceptor obtained by injections of sheep blood into an animal.

H. G.

The relationship of the lipoidal hemolysins of Bang and Forssmann to the heterogenetic sheep-blood hemolysin. Investigation of the antigenic properties of lipoids. H. SCHMIDT. *Z. Immunitäts. Abt. I, Orig.* 33, 216-32(1921); *Abstracts Bact.* 6, 205.—A brief review is given of the work of Forssmann, Bang and others on the so-called heterogenetic antibodies and heterophile antigens. From the organs of guinea pigs, dog, cat, horse, hen and turtle can be obtained heterophile antigens, which when injected into rabbits cause the production of antisheep erythrocyte hemolytic amboceptor. These antigens are thermostable and are sol. in ether, alc., and lipid solvents. S. prepd. these antigens in several ways, and injected them intravenously into rabbits as follows: (1) acetone-sol. fraction of the lipoids of sheep erythrocytes, (2) acetone-insol. fraction of the lipoids of sheep erythrocytes, (3) sheep cells deprived of lipoids, (4) sheep blood platelets. The purpose of the expts. was to det. whether sheep cells contained the lipoidal heterophile antigen. Pptn., complement-fixation tests and hemolytic tests were made with these antisera and with sheep cells, exts. of sheep cells free from lipoids, and lipoidal exts. of sheep cells and of the organs of the animals listed above which are known to contain heterophile antigens. No tests are reported to show whether or not the so-called lipoidal exts. were free from proteins. The expts. showed that the so-called Forssmann and Bang lipoidal lysinogen from sheep cells is not a purely heterophile antigen. The rabbits injected with it produced an antiserum which contained a small amt. of heterogenetic lysin, with a large amt. of the strictly sp. isogenetic antisheep hemolysin. The antiserum produced by the injection of sheep cells which had been deprived of their lipoids contained no heterogenetic lysin or other antibodies, but contained small amts. of the isogenetic antibody. The lipoidal principle of the cells of the sheep, therefore, corresponds only partly to the heterophile antigens of the

guinea pig group. The antiserum produced by immunizing a rabbit to the sheep blood platelets contained only isogenetic antibody. H. G.

The relationship between products of the decomposition of organs and the Wassermann reaction. W. BACHMANN. *Z. Immunitäts. Abt. I, Orig.* 33, 233-46(1921); *Abstracts Bact.* 6, 207.—A serum which gives a negative Wassermann reaction can be made to react positively in this test by adding to it a 1 to 1,000,000 diln. of glycocholl, or a 1 to 10,000 diln. of leucine or tyrosine. The injection of these amino acids into rabbits, which gave negative Wassermann reactions before the injection, caused the sera of these animals to become Wassermann-positive. The ninhydrin reaction ran parallel to the Wassermann reaction in 93% of the comparative tests on 30 sera. The ninhydrin reaction was performed on the filtrate from the sera after coagulation of the proteins, and tests were made to det. whether the proteins had been completely removed. The injection of certain "partigen lipoids" of Much into rabbits caused the sera of these animals to become Wassermann-positive. The decompn. products of proteins from the tissues of the body may be responsible for the fixation of complement as detd. in the Wassermann reaction. H. G.

The antigenic properties of tuberculin. E. SELIGMANN AND F. KLOPSTOCK. *Z. Immunitäts. Abt. I, Orig.* 33, 467-77(1922); *Abstracts Bact.* 6, 381.—By repeated injections of large amts. of old tuberculin, the authors succeeded in making guinea pigs hypersensitive to tuberculin. The state of hypersensitivity was demonstrated in such animals by the appearance of typical anaphylactic shock after the intravenous injection of tuberculin, local reactions at old sites of intracutaneous injections after the subcutaneous injection of tuberculin, and the appearance of Arthus' phenomenon. It was not, however, possible to render guinea pigs so hypersensitive that they reacted with these 3 typical anaphylactic reactions to a subcutaneous or intracutaneous injection. H. G.

The adsorption of bacteria and agglutinins by suspensions and colloids. L. BLEYER. *Z. Immunitäts. Abt. I, Orig.* 33, 478-503(1922); *Abstracts Bact.* 6, 364.—Bacterial immune agglutinins are only incompletely and inconstantly adsorbed by suspensions of large particles. Animal charcoal is the best of these adsorbents. Agglutinins of low titer are more readily adsorbed than antibodies of high titer. Agglutinins of the same specificity, but in the sera of different animals, are adsorbed differently by these suspensions. This is attributable to differences in the sera of the animals. Suddenly formed voluminous ppts., which sink quickly in the tubes, such as $\text{Fe}_2\text{O}_3\cdot\text{AgCl}$ and $\text{Al}_2(\text{OH})_6$, adsorb agglutinins very slightly. On the other hand, finely dispersed ppts., such as BaSO_4 , adsorb most of the agglutinin in a serum. The hydrosols of the metals adsorb agglutinins from serum almost completely. Prolonged contact, with the temp. as high as 37° , had no definite relation to the amt. adsorbed, and the elec. charge of these colloidal particles seemed to have no definite relationship to the adsorption of agglutinins. Colloidal protein solns., such as caseosan, had only a small, inconst. adsorbing action. After the agglutinin had been adsorbed by the colloid, it was retained in the gel state. When the colloid was redispersed and mixed with bacteria homologous to the agglutinin, the bacteria were specifically agglutinated, showing that they removed the agglutinin from its adherence to the colloid particles of the metallic sol. Heat and 0.01 N NaOH failed to split off the agglutinin from its union with the colloid. Animal charcoal and metallic hydrosols adsorb proteins from serum as well as agglutinins. H. G.

Serological studies with the aid of the Zeiss fluid interferometer. W. BACHMANN. *Z. Immunitäts. Abt. I, Orig.* 33, 551-75(1922); *Abstracts Bact.* 6, 364; cf. C. A. 17, 1668.—This article gives a fairly complete description of an interferometer which has been adapted for the measurement of very small differences in the mol. concn. of fluids. The instrument is more accurate than the refractometer. Expts. with some of the immunological reactions were performed to test the usefulness of the instrument. Measurements show that an autolysis of the serum does not occur. After an immune serum has been used for an agglutination reaction, and the bacteria have been removed, the serum shows a definite decrease in its concn. The greater the diln. of the immune serum in the agglutination reaction, the less the decrease in concn. If the immune serum is allowed to act upon the bacteria longer than 2 hrs., the concn. becomes increased, owing probably to enzymes splitting up the antigen. Changes in the concn. of the serum after complement-fixation reactions and the Sachs-Georgi pptn. test are also described. H. G.

The influence of salt content on the capacity of active sera to react in the precipitation methods used in the serological diagnosis of syphilis. F. GEORGI AND H. LEBENSTEIN. *Z. Immunitäts. Abt. I, Orig.* 33, 503-10(1922); *Abstracts Bact.* 6, 379.—In

agreement with earlier findings it is shown again that inactivated sera form ppts., if the sera are from syphilitics, with Meinicke's ether ext. of heart muscle (third modification) in the presence of both 0.85% and 2% salt soln. On the other hand, the ppt. formed by fresh active syphilitic serum under the same conditions is directly dependent upon the salt content of the fluid. While the active serum in 0.85% salt soln. only rarely reacts positively, it gives a ppt. comparable to that formed by inactivated serum in 2% salt soln. In the fresh active serum there are inhibiting substances which interfere with both the Meinicke and Sachs-Georgi reactions. These inhibiting substances are themselves inhibited in 2% salt soln. and disappear when the serum ages. These findings demonstrate anew that both of these reactions are based upon the same fundamental processes.

H. G.

Observations on the value of phenoltetrachlorophthalein in estimating liver function. G. M. PIERSON AND H. L. BOCKUS. *Arch. Intern. Med.* 31, 623-36(1923); cf. *C. A.* 8, 1438, 1971; 10, 2478; 16, 944.—The test is modified by employing continuous drippings from the duodenal tube, which is attained by the ingestion of 500 cc. H₂O, and observing the time elapsed between the intravenous injection of 150 cu. mm. of the dye and the first appearance of a max. red color in the basin receiving the drippings, which has previously been charged with 3-4 cc. 40% NaOH. The drippings are collected in 4 periods of 30 min. each. To each specimen NaOH is added to secure the max. color and the mixt. is dild. to 1000 cc. In order to ppt. the bile pigments, 100 cc. of this soln. is treated with 3 cc. satd. basic Pb acetate soln. and 2 cc. satd. CaCl₂ and filtered into a 100-cc. bottle and compared with standards contg. 0.1, 0.2, 0.3, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12.5, 15, 17.5 and 20 mg., resp., of the dye per 100 cc. The test was used in 50 cases. The dye output in 2 hrs. is probably of more importance than the time of first appearance but both should be considered. "In grossly pathologic livers the appearance time of max. color was twice as long as that in normal cases (23.2 min. as compared to 11.6 min.) and the dye output averaged but 1/3 of the output in normal cases (2.71 mg. as contrasted with 22.4 mg.). It is believed that the test will develop great usefulness.

I. GREENWALD

Quantitative studies in syphilis from a clinical and biologic point of view. II. Normal arsenic. J. A. FORDYCE, ISADORE ROSEN AND C. N. MYERS. *Arch. Intern. Med.* 31, 739-57(1923).—By the methods previously described the blood, urine, hair and milk from about 200 subjects were examd. with the result that "we can conservatively state that As is found 'normally' in a large number of persons, depending on the character of their food, drink, medication and environment. In the few who could be relied on the analyses showed quite definitely the absence of As where an As-free diet had been carried out."

I. GREENWALD

Uricacidemia, based on a study of 1500 chemical analyses. H. M. FEINBLATT. *Arch. Intern. Med.* 31, 758-65(1923).—"A study of 1500 persons with routine blood chem. analyses showed the great majority of patients with high blood concn. of uric acid but not of urea N or creatinine exhibited no evidence at all of early chronic interstitial nephritis. In uremia there is a lack of parallelism between the figures for uric acid, on the one hand, and those for urea N and creatinine on the other. Frequently, with mounting urea N and creatinine, and deepening coma, terminating in death, the concn. of uric acid takes a marked drop. There is often but slight retention of uric acid in moribund uremics." A high concn. of uric acid in the blood is a symptom but is not, in itself, diagnostic of early interstitial nephritis or any other condition.

I. G.

Immunity and accessory foodstuffs. K. STOLTE. *Deut. med. Wochschr.* 48, 1036-7(1922).—The ability of the organism to resist infection is reduced by a vitamin deficiency. Vitamin-rich foods enhance resistance; they are factors in immunity.

MILTON HANKE

The relations between polycythemia and hypercholesteremia in the pregnant. R. BRENDA. *Arch. Gynäkol.* 116, 506-19(1923).—The cholesterol content of the blood is markedly increased during the last weeks of pregnancy. After child birth the cholesterol content sinks to normal but is still noticeably high on the 8th day post partum. In cases with polycythemia the cholesterol content of the blood is higher than normal. There seems to be an intimate parallelism between the cholesterol and erythrocyte curves. The cholesterol of the blood of the pregnant seems to have an influence on the no. of the red corpuscles through inhibition of the destruction of the red corpuscles and the polycythemia is due in part also to the stimulation of the erythropoietic organs, particularly the bone marrow.

HARRIET F. HOLMES

Metabolism and internal secretion during pregnancy. H. W. KNIPPING. *Arch. Gynäkol.* 116, 520-34(1923).—There is an abrupt physiologic terminal loss of wt. in the pregnant at about the 3rd. day before child birth. It seems probable that changes in

function of the anterior lobe of the hypophysis are responsible for the loss of wt. and for typical changes in basal metabolism. Basal metabolism studies indicate that the greater no. of cases of corpulence at the menopause are not due to involution of the ovaries but are of pituitary origin, and have followed child birth. HARRIET F. HOLMES

Wassermann and Sachs-Georgi reactions during child birth. F. WILLENBÜCHER. *Arch. Gynäkol.* 116, 558-70 (1923).—Wassermann and Sachs-Georgi reactions are unreliable at the time of child birth. Examn. of the blood of the mother, of the child and of the placenta in 90 normal women showed an unspecific inhibition of hemolysis in a no. of cases, though 8 days after child birth the reactions were negative. It is suggested that lipoids of bacteria such as staphylococci which are commonly present may produce antilipoids sufficient to inhibit hemolysis. HARRIET F. HOLMES

Determination of non-protein nitrogen at the end of pregnancy, before and after delivery. K. HEILMUTH. *Arch. Gynäkol.* 118, 18-58 (1923).—The non-protein N content of the blood is lowered towards the end of a normal pregnancy. The urea content of the blood is subnormal at the end of pregnancy but begins to rise shortly after delivery and is normal again by the second week. The uric acid content of the blood at the time of child birth is slightly above normal and then decreases gradually. No changes were noted in the creatinine content of the blood during pregnancy. In the toxicooses of pregnancy, nephrosis and eclampsia, there is no noticeable increase in non-protein N in the blood, but the urea is increased both absolutely and proportionally to the non-protein N. The uric acid is increased in eclampsia during attacks to about 3 times the normal amt. Estn. of the uric acid in the blood is the most delicate indicator known at present for detg. the degree of injury to the kidneys. The creatinine content of the blood showed no changes in eclampsia and preëclampsia. H. F. H.

Action of placenta optone. E. PUPPEL. *Arch. Gynäkol.* 116, 571-7 (1923).—Animal experimentation and clinical use show that placenta optone, an ext. of placenta prepd. by Abderhalden's method, exerts a sp. action indicating an internal secretion. HARRIET F. HOLMES

Diabetes mellitus and urobilinogenuria. GEZA HETENYI. *Berl. klin. Wochschr.* 58, 1462-3 (1921).—Urobilinogenuria does not occur in diabetes even if complicated with conditions that usually produce urobilinogenuria. This eliminates the question of a hepatic diabetes. No definite reason can be given for the difficulty of excretion of urobilinogen in the urine in diabetes. JULIAN H. LEWIS

Blood sugar metabolism. ERICH MEYER. *Berl. klin. Wochschr.* 58, 1542-3 (1921).—When normal individuals, patients with epilepsy, dementia paralytica, icterus, or encephalitis take 20 g. of glucose on an empty stomach they show a rise of the blood sugar with its max. in the 2nd half hr. after the injection. When later 100 g. of glucose are given the blood sugar rises only in icterus and nitrobenzene intoxication. In diabetes the rise of the blood sugar after 20 g. of glucose is much more intense. The regulation of the blood sugar depends not upon the liver alone, but also upon the pancreas, the bowels, the central nervous system and the endocrine organs. J. H. L.

Studies in intermediate carbohydrate metabolism in man. I. The occurrence of aldehyde substances in the urine of diabetics. WILHELM STEPP AND HERMANN LANGE. *Deut. Arch. klin. Med.* 134, 47-58 (1920).—In the urine of many diabetics is a volatile substance which reduces Fehling soln. This substance forms CHI_3 in an alk. soln. of I, but, different from acetone, which also forms CHI_3 , it is destroyed by boiling with Ag_2O with a reflux condenser. These facts are characteristic of aldehyde-like substances. Other aldehyde reactions are positive, such as the reduction of ammoniacal soln. of Ag in the cold and the reddening of fuchsin- H_2SO_4 . The positive Rimini reaction with Na nitroprusside and diethylamine identifies the substance as acetaldehyde. It appears in the urine along with acetone and acetoacetic acid at the beginning or with an increase of acidosis. II. **The quantitative relations of formic acid in normal and pathological blood.** WILHELM STEPP AND HERMANN ZUMBUSCH. *Ibid* 112-8.—Formic acid can be distd. *in vacuo* from blood which has had the protein removed with phosphotungstic acid, and the phosphotungstic acid removed with neutral Pb acetate. One mg. of formic acid added to blood can be recovered quantitatively in this manner. In order to bind the formic acid immediately it is received into a soln. of soda. The distillate is evapd. to dryness on the H_2O bath, taken up in a few cc. of H_2O and the formic acid estd. by the method of Riesser (*C. A.* 10, 2754). In 10 healthy people the formic acid in the blood varied between 1.12 mg. and 8.449 mg. per 100 cc. In 14 cases of diabetes only a trace was found in 3 cases, and in the remaining it was below that of the normal av. Only in 2 cases was it over 4 mg. per 100 cc. In 11 cases of renal disease the formic acid value was also below the normal. JULIAN H. LEWIS

The classification of the phenomena of hypersensitiveness. A. F. COCA AND R.

A. COOKE. *J. Immunol.* **8**, 163-82(1923).—Hypersensitiveness is divided into 2 groups, a normal including serum disease and dermatitis venenata, and an abnormal, including anaphylaxis, the hypersensitiveness of infection, and "atopy" (the inherited hay fever, asthma type).

E. R. LONG

Hepatic reactions in anaphylaxis. IV. The dominant reacting tissue in peptone shock. W. H. MANWARING, W. S. CLARK AND R. C. CHILCOTE. *J. Immunol.* **8**, 191-4 (1923).—Marked fall in arterial blood pressure is produced by intravenous injections of peptone into dehepatized dogs. Canine peptone shock and canine anaphylactic shock therefore cannot be regarded as identical reactions. Recovery from peptone shock does not take place in dehepatized dogs. **V. Mechanism of the increased hepatic reaction during canine peptone shock.** W. H. MANWARING, W. O. FRENCH AND SELLING BRILL. *Ibid* 211-5.—The dominant factor increasing resistance to blood flow through the liver during peptone shock is a suddenly increased permeability of the sinusoidal endothelium. This produces an explosive hepatic edema accompanied by swelling of the parenchymatous cells, increasing local tissue pressure sufficiently to cause sinusoidal vasoconstriction and passive constriction of the hepatic veins. The sudden loss of fluid from the sinusoidal blood increases local blood viscosity sufficiently to cause temporary sinusoidal stasis, and stasis even in the narrowed hepatic veins. A minor factor is sinusoidal narrowing from leucocytic deposits. There is no evidence that hepatic vasoconstriction is a factor in the reaction. **VI. Histamine reactions in isolated canine tissues.** W. H. MANWARING, R. E. MONACO AND H. D. MARINO. *Ibid* 217-21.—The dominant factor producing the acute fall in arterial blood pressure in canine histamine shock is probably the suddenly increased permeability of the capillary endothelium. The dominant reacting tissues are distributed fairly evenly throughout the body. The most striking reaction in blood-free perfusions of isolated canine tissues is an explosive edema. Reactions of secondary importance are a marked decrease in perfusion resistance in the hind quarters, and marked increase in perfusion resistance in the lungs, liver, intestines and kidneys. These reactions would tend to neutralize each other in their effects on arterial blood pressure. The increased perfusion resistance is probably largely due to increased pressure from edema. **VII. Quantitative changes in the hepatic parenchyma during canine peptone shock.** W. H. MANWARING, H. M. HOSEPIAN AND A. C. BEATTIE. *Ibid* 229-31.—The net wt. of the liver exclusive of the wt. of the contained blood is increased as much as 95% during the early stages of peptone shock. The av. increased net hepatic wt. represents a withdrawal of 11.7 cc. plasma from the circulating blood per kg. body wt. The resulting decrease in blood vol. must be an important factor in the production of the characteristic fall in arterial blood pressure. **VIII. Anaphylactic reactions in isolated canine organs.** W. H. MANWARING, R. C. CHILCOTE AND V. M. HOSEPIAN. *Ibid* 233-8.—The isolated organs of dogs sensitized to horse serum when perfused with Locke's soln. contg. 0.04-2.5% horse serum give the following reactions: lungs, slight preliminary vasodilation, followed by pronounced vasoconstriction, and marked edema; intestines, distinct vasoconstriction and marked edema; liver, slight vasoconstriction and slight edema; hind quarters, a slight vasodilation without edema or a slight vasoconstriction with marked edema. The vasoconstriction in these organs may possibly be secondary to increased tissue pressure from edema. If so, increased sp. capillary permeability must be looked upon as the dominant underlying physiol. factor in these reactions.

E. R. LONG

The toxicity of human blood plasma for guinea pigs. III. The toxicity of human blood plasma in the various stages of pulmonary tuberculosis. S. A. LEVINSON. *J. Immunol.* **8**, 183-90(1923).—The toxicity of human blood plasma for the guinea pig is increased in pulmonary tuberculosis. The more advanced the tuberculosis is, the higher is the toxicity of the plasma. With increase in the activity of the tuberculous process there is an increasing sedimentation rate of erythrocytes.

E. R. LONG

Serological factors of natural resistance in animals on a deficient diet. G. H. SMITH AND ISABEL M. WASON. *J. Immunol.* **8**, 195-200(1923).—Serums from animals maintained upon a rickets-producing diet show differences from the serums of normally fed animals. Chief of these is a marked difference in bactericidal titer. Values for the most active serums among the rachitic rats are well below the lowest values for normal animals. Complement titrations show little variation; little correlation appears between complementing activity and bactericidal value of serum. Phagocytic indices, while subject to considerable variation, are in general somewhat lower in the animals on the deficient diet.

E. R. LONG

Biological reactions of X-rays. Effect of X-rays on the rates of specific hemolysis. KARL F. CORI AND G. W. PUCHER. *J. Immunol.* **8**, 201-9(1923).—The radiation of the

individual components of a hemolytic system does not increase the rate of hemolysis of that system. Radiation of the whole hemolytic system increases the rate of hemolysis. X-rays influence the velocity at which the equil. of a reaction is reached.

E. R. LONG

Zone phenomena in complement fixation with "residue" antigens. JULIA T. PARKER. *J. Immunol.* 8, 223-8(1923).—Minute amts. of antibody or antigen can be demonstrated by complement fixation, provided the antigen, or the antiserum, used in the reaction is employed in a series of diminishing amts. Unless this procedure is adopted small amts. of antigen or antibody present may escape detection. The strongest results in complement fixation are obtained when the complement is present from the beginning when antigen and antibody meet.

E. R. LONG

Quantitative relations between amboceptor and the serum of complement-deficient guinea pigs. H. E. ECKER. *J. Infectious Diseases* 29, 611-4(1921).—The deficient action of the serum of guinea pigs that have a marked deficiency in complement is not due to amboceptor interference because the increase of amboceptor leads to hemolysis of the cells. These serums when employed in comparatively small doses (0.1 cc.) and in the presence of 500 units of hemolysin readily cause lysis, while large doses (1.0 cc.) will not cause lysis with 500 units or 2 units of hemolysin. The deficient serums react in a similar manner as cobra venom inactive serums in that the addition of normal inactive homologous or heterologous serums will markedly enhance hemolysis. Various inactive serums have varying degrees of activating power when added to the deficient serum amboceptor cell mixt. The same phenomenon has been observed in the case of cobra venom inactivated serum. By the increase of amboceptor and the addition of normal inactive homologous or heterologous serums the deficient serums have been made to act within the usual lytic range of normal guinea-pig serum.

J. H. L.

Studies on complement fixation (II). The velocity of fixation of complement in the Wassermann test. R. L. KAHN AND R. M. OLIN, JR. *J. Infectious Diseases* 29, 630-8 (1921).—It was observed in the study of the velocity of fixation of complement in the Wassermann reaction that the velocity is not markedly affected by temps. ranging between bath and ice box. The tendency for slightly stronger fixation at ice-box temp. compared with that of H₂O bath was noted with all antigens, except the Noguchi. The latter antigen showed a tendency for somewhat stronger fixation at H₂O-bath temps. It was also observed that a fixation period of 4 hrs. at ice-box temp. approaches the max. amt. of fixation of complement with all antigens, including the Noguchi, although the latter in a few cases showed slightly more fixation after 1 hr. in the H₂O bath than after 4 hrs. in the ice box. Finally, it was shown that the velocity of fixation of complement is directly proportional to the concn. of antibodies in the syphilitic serums.

JULIAN H. LEWIS

The precipitation of colloidal gold in the cerebrospinal fluid of horses with dourine. F. H. K. REYNOLDS AND H. W. SCHOENING. *J. Infectious Diseases* 31, 59-63(1922).—The colloidal Au test, when applied to the spinal fluids of horses suffering from dourine, in many instances gives reactions of varying intensity. A no. of the reactions are similar to those in cases of cerebrospinal syphilis in which the peak of the curve is found at the center of the scale. In some instances, the reactions recorded attained a height of 5. In other cases the reactions showed a tendency to rise and stopped abruptly at 1, 2 and 3, then dropped to 0. This suggests the possibility that a more energetic curve might have been obtained had the disease progressed to a greater degree before the destruction of the animal. Some of the curves are similar to those in meningitis, while no reactions of the paretic type were obtained. While reactions were obtained with the colloidal Au test, just what they may indicate cannot now be stated in the absence of careful study of the spinal cords. However, in the presence of a positive serum test and in some cases of clinical evidence, it would appear that the reactions would be of some significance. In many cases there appeared to be no agreement between the serum fixation, fluid fixation and the globulin and colloidal Au tests.

JULIAN H. LEWIS

Hyperglucemia—based on a study of 2000 blood chemical analyses. H. M. FEINBLATT. *J. Lab. Clin. Med.* 8, 500-5(1923).—Out of 2000 routine blood sugar detns. 81 yielded readings in excess of 150 mg. per 100 cc. 34 of these, or 42%, presented clinical evidence of diabetes mellitus. The remaining 47 were considered non-diabetic. In 30% of this group the hyperglucemia could be accounted for on other grounds than diabetes. A single report of hyperglucemia may be misleading, as the condition may be transient and the result of emotional disturbance. The renal blood sugar threshold varies in different individuals and in the same individual under different conditions. It is high in diabetes and increases in proportion to the severity of the disease.

E. R. LONG

The importance of protein hypersensitivity in the diagnosis and treatment of a special group of epileptics. R. L. MACKENZIE WALLIS AND W. D. NICOL in collaboration with MAURICE CRAIG. *Lancet* 1923, I, 741-3.—Of 122 epileptics 76 showed hypersensitivity to various proteins on skin test. 28 reacted to peptone, 15 to cereals, 15 to fish and meat, 9 to eggs, 9 to vegetables, and 3 to milk. Of 100 control cases, including 70 of dementia precox, only 4 showed protein hypersensitivity; these were patients with dementia precox who reacted slightly to peptone. Improvement followed in most cases on dietary adjustment.

E. R. LONG

Peptone immunization in asthma and other allergies. A. G. AULD. *Lancet* 1923, I, 790-5.—Peptone given intravenously or intramuscularly in increasing doses of a 7.5% soln., beginning at 0.3 cc. and going to 1.5 cc. or over, by 0.2 cc. stages, caused relief from asthma of a variety of types. Protein hypersensitivity, as shown by the skin test, decreased at the same time, but in most instances did not disappear. There was a simultaneous relief in associated allergic conditions, as horse asthma and hypersensitiveness to eggs. The improvement ensued in the absence of visible reaction to the peptone.

E. R. LONG

The present position of diabetes and glucosuria, with observations on the new insulin treatment. HUGH MACLEAN. *Lancet* 1923, I, 1039-46.—A review. E. R. L.

The mode of action of vitamins. W. CRAMER. *Lancet* 1923, I, 1046-50.—Pathol. studies were made in animals suffering from vitamin deficiency. Marked degeneration of the intestinal epithelium was noted in rats deprived of vitamin A. Underfeeding with vitamins renders rats more susceptible to intestinal infection. Rats kept in the dark from birth show no intestinal lesions and grow normally, but have less than the normal number of blood platelets. When deprived of vitamins such animals show the symptoms of avitaminosis sooner than rats kept in daylight. Vitamin A deficiency likewise causes a reduction in the no. of blood platelets.

E. R. LONG

Studies of the in vitro glucolysis of tumors. PIERRE MAURIAC, A. BONNARD AND L. SERVANTIE. *Compt. rend. soc. biol.* 88, 706-7(1923).—With fibromas and lipomas no glucolytic action was observed. With various other tumors the degree of glucolysis was found to vary greatly though it did not exceed that of a normal salivary gland. The one exception was the case of an epithelioma which was intensely glucolytic.

S. MORGULIS

Thyroid gland and anaphylaxis. LÉON KÉPINOW. *Compt. rend. soc. biol.* 88, 846-8(1923); cf. *C. A.* 16, 3965.—Small doses of thyroid gland given by mouth on the same day when the injection is made into sensitized guinea pigs exert no influence on the progress of the anaphylactic shock, but similar doses administered 2 days before the injection diminish the resulting shock. With increasing doses of thyroid gland its inhibitory action becomes annihilated so that large doses really make the animals more sensitive to the anaphylactic reaction.

S. MORGULIS

Experimental rickets. A. B. MARFAN. *Le Nourrisson* 11, 121(1923); *Bull. soc. hyg. aliment.* 11, 256-7(1923).—Critical review of recent work. A. P.-C.

Serum lysins. R. W. PRYER. *Am. J. Pub. Health* 13, 470-2(1923).—Preliminary work seems to indicate that there is a lytic principle in certain blood sera which is not a true bactericidal antibody. It is believed that this lytic principle is almost specific for this spore-bearing alkali-producing coccus-like organism, and that the identification of these organisms in this way is as specific as agglutination or pptn. tests for ordinary organisms.

NATHAN VAN PATTEN

Studies in arthritis. The blood gases and blood flow. R. PEMBERTON, B. M. HENDRIX AND CAROLINE Y. CROUTER. *J. Metabolic Research* 2, 301-28(1922).—The O_2 content and capacity of the venous blood, the CO_2 content, the dissociation curves for O_2 and CO_2 , sugar tolerance and the rate of blood flow through the hands were studied in a series of 77 cases of arthritis and in 40 others cases representing normal health and various types of disease. The influences of fasting, food, rest, exercise, external heat (bakes), drugs and other factors were studied. The previously observed high incidence of lowered sugar tolerance, especially in the more active stage of arthritis, is corroborated. A rise in the % of O_2 satn. of the blood of arthritics with a low sugar tolerance was observed whenever a tourniquet was used shortly before drawing the blood. The av. O_2 satn. value at fasting level was: for 13 arthritics with low sugar tolerance 78.33%; for 8 arthritics with normal sugar tolerance 64.06%; for 3 normal subjects 40.09%. For the entire group of 77 arthritics the % of O_2 satn. varied between 26 and 97%, av. 53.68%, which is considerably higher than the values obtained for 12 normal fasting subjects whose % satn. varied between 27 and 51%, av. of 41.71%. These differences could not be explained on the basis of external temp., activity, state of nutrition or other obvious factors. The high % satn. figures of 6 in a series of 8 arthritics fell within

normal limits during the process of convalescence. The dissociation curves for O_2 and CO_2 of the blood of a number of arthritics studied fell within normal limits with few exceptions. Attempts to correlate a high % of O_2 satn. in arthritic blood with changes in the rate of blood flow were not successful. The rate of blood flow in 11 fasting resting arthritics was found to be essentially similar to that of 6 normal individuals tested under the same conditions. Blood studies conducted in a series of "bakes" on arthritics and normals showed that the O_2 satn. rose in 82%, owing chiefly to a rise in the O_2 content. The alveolar CO_2 fell below normal with the onset of perspiration and then rose above normal after the bake. The curve for the blood CO_2 content did not agree well with the alveolar CO_2 curve. The CO_2 capacity varied irregularly in the 8 cases studied.

W. A. PERLZWEIG

Effects of insulin on diabetic dogs. S. W. BLISS. *J. Metabolic Research* 2, 384-400 (1922).—The findings of Banting and Best and of Macleod and collaborators concerning the effect of insulin upon totally depancreatized dogs were confirmed. A totally depancreatized dog was maintained in good physical condition without diabetic symptoms for one month by means of insulin. Death followed as a result of the insufficiency of the external pancreatic secretion. The susceptibility of depancreatized dogs to hypoglycemic collapse following overdosage of insulin was also noted, as well as the possibility of counteracting this effect by means of sugar injections. The insulin requirement of a totally depancreatized dog of 8.5-9 kg. body wt. was found to be approx. 6 units per day, distributed in 1 unit doses every 4 hrs. The administration of the 6 units in a single dose brought on collapse, followed by a return of glucosuria. Heavy glucosuria and hyperglucemia were abolished in a partially depancreatized dog by 5 units of insulin. "A partially depancreatized dog dying of diabetic coma was not saved by the injection of 16 units of insulin, though the blood sugar was reduced nearly to normal, the acetone nearly disappeared, and no chemical reason for death was apparent. The plasma bicarbonate fell progressively to death and was entirely independent of the acetone values, the insulin injections and the blood sugar changes. Traces of glycogen were found almost equally in the liver, heart and skeletal muscles at autopsy. It is assumed that the insulin treatment fails in advanced coma because unknown secondary changes prove fatal in spite of the clearing up of the primary diabetic disorder."

W. A. PERLZWEIG

The role of respiration processes during the latent period of Röntgen-ray injury. EUGEN PETRY. *Wiener klin. Wochschr.* 36, 51-2(1923); cf. *C. A.* 16, 1971; 17, 797.—A preliminary communication to be published in detail elsewhere.

W. A. P.

Thyroidectomy and immunity; thyroïdal allergy. AMERICO GARIBALDI. *Compt. rend.* 176, 1341-3(1923).—Thyroidal allergy presents 3 aspects as follows: (1) Phase of hypersensibility (strong toxic infections, large doses, antigens sol. or very toxic); the phenomena of hypersensibility mask the phenomena of immunity. (2) Phase of hyperimmunity (mild toxic infection, small doses, antigens slightly or not toxic); the phenomena of hypersensibility are masked by the phenomena of immunity. (3) Phase of iso-immunity (exptl. conditions intermediate between those of (1) and (2)); an obscure entanglement of the phenomena of hypersensibility and of immunity. Thyroidal insufficiency appears to be able to create an allergic condition independently of previous inoculation. This thyroidal allergy cannot be well explained if it is admitted that the hypothyroidal condition provokes a lowering of the threshold of antixenic excitability of the tissues which are most concerned in the phenomena of immunization. A slight excitation (mild toxic infection) provokes a marked defensive reaction of which the allergic phase of hyperimmunity would be the objective translation. A strong excitation provokes, on the contrary, always the phenomena of inhibition or of paralysis of which the allergic phase of hyp immunity would be the consequence. It may be conceived that between these extremes the intermediate phenomena would be interpreted by the allergic phase of iso-immunity.

L. W. RIGGS

Complement fixation in treated and untreated leprosy. E. W. GOODPASTURE. *Philippine J. Sci.* 22, 425-36(1923).—The Wassermann reaction was found to be positive in 60% of untreated nodular and mixed cases of leprosy and in 84% of similar cases treated with chaulmoogra oil or its products for a few months but still bacteriologically positive. In 16 cases of nodular and mixed leprosy that had become clinically and bacteriologically negative under treatment with chaulmoogra oil the Wassermann reaction was uniformly negative. Complement-fixation tests in 24 cases of nodular, mixed and anesthetic leprosy, using an antigen composed of a suspension of *Bacillus tuberculosis* (human), gave positive results in every case. In 20 cases of nodular and leprosy, clinically and bacteriologically negative after treatment with chaulmoogra oil or its products, 2 were negative, 3 gave complete fixation, 1 was strongly

positive, and 14 weakly positive, with a suspension of *B. tuberculosis* as antigen. The complement-fixation test with bacterial antigen promises to be of service as a means of measuring the response of leprosy patients to treatment. L. W. RIGGS

Relation of lipidemia to the development of xanthomas. S. YAMAKAWA AND M. KASHIWABARA. *Tohoku J. Exptl. Med.* 3, 317-32(1922).—In the cases studied the cholesterol and neutral fat content of the serum was 3 times that of normal and the phosphatide content was above normal. A large amt. of free cholesterol was found in the tumor masses and approx. as much cholesterol ester, but only a trace of phosphatides. Xanthoma, which to-day is classed in the group of tumor diseases, in the future as with gout, diabetes mellitus and the like, will be classed with the metabolic diseases. L. W. RIGGS

Nature of anaphylactic shock. II. Gas metabolism in shock in pigeons. EMIL ABDERHALDEN AND ERNST WERTHEIMER. *Arch. ges. Physiol. (Pflüger's)* 196, 429-39 (1922).—Anaphylactic shock in pigeons, induced by the reinjection of beef serum into sensitized animals, is characterized by a temp. fall and a diminution in the values expressing the total gas metabolism and the tissue respiration. III. *Ibid* 440-8.—Pigeons which had been fed upon polished rice, and hence had a diminished gas exchange, were more sensitive to anaphylactic shock than were pigeons which had been upon a normal diet. G. H. S.

Excretion of bile acids in cystinuria. HANS EPPINGER. *Arch. exptl. Path. Pharm.* 97, 51-3(1923).—The chem. compn. of the urine in a case of cystinuria is compared with the values for normal urines. The urine in question contained 0.1-0.2 g. of cystine per day. The amt. of bile acids excreted was diminished (taurocholic acid 0.47, glycocholic acid 1.76). G. H. S.

Guanidine intoxication in mammals. II. Experimental encephalitis. ALFRED FUCHS. *Arch. exptl. Path. Pharm.* 97, 79-85(1923).—With suitable dosage and distribution guanidine produces in cats a typical encephalitis (encephalomeningomyelitis), which in symptomatology and in histo-pathology reproduces completely the disease picture seen in infectious encephalitis in man. G. H. S.

Quinine and hemoclasia. MAX GROSSMANN. *Arch. exptl. Path. Pharm.* 97, 147-55(1923).—In various types of cases, all of which were free of liver disturbance, the injection of quinine either caused no change in the leucocyte count or increased it. Of the latter, the usual reaction was an increase in lymphocytes. In cases of liver disease (cirrhosis, icterus) the injection of quinine is attended by a reduction in the number of leucocytes. G. H. S.

The mineral metabolism of diabetics. ROBERT MEYER-BISCH AND PAUL THYSSSEN. *Biochem. Z.* 135, 308-16(1923).—In 4 diabetics, 50 g. NaHCO_3 lowered the blood Ca. The max. decrease was from 12.2 to 10.8 mg. per 100 cc. 2 to 3 hrs. after bicarbonate ingestion. Free and ethereal SO_4 also showed changes. Normals (5) did not show these effects. G. E. SIMPSON

The salt content of malignant tissues. G. L. ROHDENBURG AND O. F. KREHBIEL. *J. Cancer Research* 7, 417-37(1922).—A study of the microchemistry of malignant and benign rat tissue cells shows that demonstrable changes occur in the salt content of the tissues and blood consisting in a demineralization of the blood and tissue cells upon the parenteral introduction of living cells, irrespective of their type, with an increase of the mineral content of the growing cells. Upon the death and absorption of the cells they give up their mineral content which again is rapidly taken up by the body tissues and the blood. There also occur disturbances in the ratios existing between the various salts. These changes in the salt metabolism do not apparently influence the origin of neoplasms, nor have they any demonstrable effect upon immunity against the transplantation of rat and mouse tumors, nor do they cause such transplanted tumors to recede. It is therefore probable that the changes observed are secondary to cell growth and death, and bear no relationship to the biological character of the cells which grow or die. H. G. WELLS

The immune bodies, which react against alcoholic organ extract. KIYOWO TAOKA. *Kiassato Arch. Exptl. Med.* 5, 1-32(1923).—The heterophile immune serum gives positive results with the alc. exts. of a certain organ in complement-fixation and pptn. reactions. The pptn. reaction is inhibited by formol. The ppts. produced in this reaction fix complement and contain a certain quantity of hemolysin. The ppts. can be sepd. into 2 parts, one ether sol. and the other ether insol. The ether-sol. portion consists of antigen having the full antigenic efficiency. The ether-insol. portion contains a comparatively pure sepd. immune body. The hemolytic, complement-fixation and pptn. powers, which the sepd. immune body liquid has, appear and disappear in parallel with one another. These cannot be sepd. by the above-mentioned method and

they probably represent the action of the self-same antibody. The immune body is destroyed by being heated at 70° for $\frac{1}{2}$ hr.; $\frac{1}{40}$ N acid and 0.05 N alkali have also the same effect. This immune body gives no protein reaction and does not dissolve in ether. The sepd. immune body does not produce anaphylaxis in the guinea pig. Even with 2.0 cc. of the sepd. immune body, there develop no symptoms of primary intoxication in the guinea pig. The immune body and the antigen which have been sepd. in a comparatively pure state can be combined again and made to give a positive reaction. The lipoidal substance which has been sepd. by the use of alc. does not develop any immune body but combines specifically *in vitro* with the heterophile immune serum produced by the heterophile organs from which such lipoidal substance has been sepd. The heterophile immune body has a close resemblance to the lactic reactive substance, but in some respects these two are different from each other. H. G. WELLS

Relation between blood destruction and the output of bile pigment. G. O. BROWN, P. D. McMASTER AND P. ROUS. *J. Exptl. Med.* 37, 733-57 (1923).—In dogs intubated for the collection of all of the bile, a marked falling off in the yield of bilirubin is regularly to be noted after operation, followed soon by an anemia of secondary character. Though in the absence of complications, the anemia is mild, it persists despite the excellent good health of the animal. Intercurrent changes in the hemoglobin % take place from time to time and these are accompanied by very similar fluctuations in the bilirubin quantity. While the destruction of the blood finds expression in terms of bile pigment and practically at once and the data support the conception that bilirubin has no other sources besides the hemoglobin of destroyed blood, the expts. show that the amt. of it put forth during the development of an anemia from gradual blood destruction, either intercurrent or induced, is far below that derivable from the net quantity of hemoglobin disappearing from the circulation. This discrepancy is referable to a process of pigment conservation which varies in proportion to the body need. This and other facts lead one to question the accepted view that bilirubin is mere waste material eliminated by way of the liver. Current methods of computing the rate of normal and pathol. blood destruction from the bilirubin (or urobilin) yield are unsound in principle and open to large error in practise. Yet there is no doubt that day-to-day variations in the output of bile pigment result from changes in the blood, and on occasion they provide enlightening evidence of the nature of hemic events. C. J. WEST

Separation of the toxins of *Bacillus dysenteriae* Shiga. JAMES E. McCARTNEY AND PETER K. OLITSKY. *J. Exptl. Med.* 37, 767-79 (1923).—By the suppression, through anaerobiosis, of the exotoxin-producing activity of *B. dysenteriae* Shiga a pure endotoxin is produced directly from the culture. The duality of the poison of Shiga bacillus is further substantiated by studies on the diffusion of exotoxin, or neurotoxin and endotoxin or enterotoxin, by means of collodion sacs, implanted intraabdominally in rabbits or placed *in vitro*. C. J. WEST

Production of antibodies in rabbits by a simplified intratracheal method. F. S. JONES. *J. Exptl. Med.* 37, 789-98 (1923).—A method is described of producing antibodies by the administration of antigens through the larynx. The procedure is relatively safe, rapid and painless and may well be employed in exptl. inoculations. The results conform closely to those obtained through intraperitoneal injection. C. J. WEST

H—PHARMACOLOGY

ALFRED N. RICHARDS

Investigations of the corona vessels of the isolated human heart. S. P. SAVODSKII. *Sssetschenofsruss. physiol. J.* 3, 219-30; *Ber. ges. Physiol.* 14, 529; *Chem. Zentr.* 1923, I, 120.—Adrenaline (1:1,000,000 and 1:500,000), caffeine (1:1000-1:2000) and camphor (1:2500) dilate the corona vessels somewhat; histamine (1:500,000) and nicotine (1:5,000) contract them noticeably. C. C. DAVIS

Analysis of certain smooth muscle responses. B. M. HARRISON AND F. M. BALDWIN. *Proc. Iowa Acad. Sci.* 28, 179-96 (1921).—A study of the effect of various concns. of EtOH on muscles of the frog esophagus and EtOH and PrOH on earthworm muscles showed decided graded qual. responses according to concn. Cf. *C. A.* 16, 2721, 2922. W. G. GAESSLER

Different reactions of the heart on endo- and exo-cardial applications of poisons. J. ONO. *Acta Schol. Med. (Kyoto)* 3, 539-62 (1920); *Physiol. Abstracts* 7, 542.—The frog heart may be functionally divided into 2 parts, since systole is said to be due to contraction of the internal layers of muscle, and diastole to contraction of the external layers. Hypertonic saline, NaOH, Na_2CO_3 , and formalin stimulate the heart in weak concns. only; strong solns. invariably paralyze. CaCl_2 , SrCl_2 , phenol, and resorcinol act

similarly, except that in strong concns. they stimulate before paralyzing. Urea and hypotonic solns. always stimulate the heart before inducing paralysis. KCl and HgCl₂ paralyze in all concns. H. G.

Toxicity of fibrin extracts. T. MASUDA. *Acta Schol. Med. (Kyoto)* 3, 457-99 (1920); *Physiol. Abstracts* 7, 359.—Fibrin exts. are extremely toxic to rabbits, less so to guinea pigs, and still less to mice and frogs. They act chiefly by paralyzing the central nervous system, but sometimes cause death by thrombosis. The toxic principle is colloidal in nature, and appears to be formed in the second stage of coagulation; the ext. invariably contains thrombogen and thrombokinase; the former has no toxic action, but the latter has. It is inactivated by heating at 56° for 30 min., by the addn. of salts, and by exposure to ultra-violet rays, but remains stable in H₂O, in which it is readily sol. It is not (Chamberland) filterable nor dialyzable, and is completely absorbed by animal charcoal. It causes blood vessels to contract, but has only a slight action in increasing the tone of the intestine. H. G.

The action of different poisons on the respiratory center. N. ISHIWARI. *Acta Schol. Med. (Kyoto)* 3, 501-38 (1920); *Physiol. Abstracts* 7, 544.—Opium, morphine, heroine, dionine, codeine, pantopon, chloral hydrate, and urethan have a soothing action on the respiratory center. Adrenaline definitely inhibits the center when injected intravenously. Nicotine, narceine, thebaine, protopine, hyoscyamine, alc., camphor, caffeine, strychnine, picrotoxin, and adrenaline (injected subcutaneously) increase the irritability of the center. HCl, apomorphine, and NH₄Cl first stimulate and then paralyze it. Chelidonium, papaverine, atropine, scopolamine, and bromocamphor have no action on the center. Atropine and hyoscyamine are antagonistic to morphine when given with it, while scopolamine enhances the morphine action. H. G.

The mechanism of the action of the salts of different aromatic acids. K. OKUSHIMA. *Acta Schol. Med. (Kyoto)* 3, 667-94 (1920); *Physiol. Abstracts* 7, 562.—The action of Na salicylate on the heart, skeletal muscle, and ductus deferens can be almost completely antagonized by the previous addn. of alkalis to the surrounding fluid medium. It would thus appear that the effect of salicylates is due to the liberation of acid by the metabolites given off by the excised organs, especially as an effect is more rapidly obtained when the organ is in activity than when it is at rest. The actions of other aromatic acids and their salts are more or less similar to the action of the salicylates, the differences depending partly on the degree of dissociation, which the salt undergoes, and partly on the sp. effect of the free acid. The relation between the various aromatic compds. and the sp. effect in turn depends upon the constitution of the aromatic compd., and the position of the various groupings in the benzene ring. H. G.

Some observations on the mechanism of drug action. O. C. M. DAVIS. *Brit. Med. J.* 1922, ii, 11-2; *Physiol. Abstracts* 7, 375.—The toxicity of elements belonging to the same periodic group increases with increase in at. wt., but this rule is subject to variations. The pharmacological activity of drugs is influenced by the soly., vapor pressure, velocity of decomposition, chem. affinity, and unsatd. valencies of the drugs; by the rate of formation of excretion products, by adsorption phenomena, and by the idiosyncrasy of the patient. H. G.

The action of extracts of endocrine glands upon motor nerve and skeletal muscle. M. YOSHIMOTO. *Quart. J. Exptl. Physiol.* 13, 5-40 (1922); *Physiol. Abstracts* 7, 556.—The following substances were examd.: exts. of pituitary (anterior and posterior lobes), thyroid, parathyroid, thymus, suprarenal, testicle, ovary, brain matter, and corpus luteum; and the following drugs: histamine, tyramine, and choline. With the concns. employed (1 to 0.1% in the case of the organ exts.), a slight depressive action on nerve (not cond.) and muscle was observed, but it would seem that there is but little reason to suspect any sp. physiol. effect of the endocrine glands on motor nerve or striated muscle, especially when one considers that the weakest of the exts. employed is probably much stronger than that which occurs in physiol. conditions within the body. H. G.

Is saccharin indifferent for the animal body? S. T. DEMIANOVSKI AND T. HEFTER. *Vrachebnoe Delo* No. 16-21, 179-82 (1921); *Physiol. Abstracts* 7, 607.—The ingestion of saccharin by man augments the secretion of gastric juice. The HCl in the stomach and the digestive power increase. H. G.

Chemical constitution and pharmacological effect. W. SCHOELLER. *Z. angew. Chem.* 36, 237-240 (1923).—Various theories are reviewed. Investigation of the problem is made more difficult by the influence that the dose has on pharmacol. action and by the tendency of the substances studied to undergo change in the body. Veronal and adalene illustrate hypnotics which in general are not chemically active. The chem. relation between the two shows their relative effectiveness. Local anesthetics, cocaine and the synthetics having similar groups, show the predominating features to be their

selective lipid soly, and the presence of the Bz radical. Org. Hg compds. vary in their toxic dose from 1.5 mg. to 1000 mg. per kg. because of the fact that the complex character of certain salts is broken up by the organism, and dissociable, highly toxic forms result. In this case the factor of instability is the distribution of the salt. HgEt_2 and $\text{Hg}(\text{CH}_3\text{CH}_2\text{CO}_2\text{H})_2$ are used to explain toxic and non-toxic salts on the basis of their relative stability in the tissues and verified by their promptness in reaction to $(\text{NH}_4)_2\text{S}$. The stability of the complex and, therefore, its toxicity depend on two factors: the influence of the adjoining group in the ring and the character of the radical occupying the second Hg valence. Toxicity varies directly as the rate of decompn. and inversely as the rate of excretion. For Hg compds. and also for As compds. the chem. test gives a more or less exact measure of the pharmacol. effect. The influence of phys. methods will tend to give renewed interest to chem. features. H. C. HAMILTON

The influence of pituitary extracts on the absorption of water from the small intestine. II. Action of pituitary extracts when introduced into the alimentary canal. M. H. REES. *Am. J. Physiol.* 63, 146-50(1922).—Pituitary ext. introduced directly into intestinal loops interfered as effectively with the absorption of water from the loops as when the pituitary ext. is injected subcutaneously (*C. A.* 14, 3712). The use of pituitary ext. in cases of diabetes insipidus is suggested. J. F. LYMAN

Toxicity of sodium-potassium tartrobismuth. G. PACELLA. *Compt. rend. soc. biol.* 88, 388-9(1923).—Detailed results of subcutaneous and intravenous injections of various amts. into frogs, pigeons, guinea pigs, rabbits and dogs are recorded. In acute poisoning death follows quickly and is preceded by these symptoms: convulsions, cardiac arrest and cessation of respiration. When either the Na or K salt of tartrobismuthate is employed it is found that while the former has practically no effect on the arterial pressure the latter has the same results as the Na-K salt. Also, expts. with the isolated frog heart show that the K salt as well as the Na-K salt brings about systolic arrest in much smaller doses than the Na salt. There is no relation between the toxicity and the amt. of Bi. S. MORGULIS

Circulation in different organs in frogs. ERNST WERTHEIMER. *Arch. ges. Physiol.* (Pflüger's) 196, 412-22(1922).—By direct observation with proper illumination the changes in the circulation of different organs under the action of various substances were detd. With adrenaline the capillaries of muscle contract; atropine, choline, acetylcholine and pilocarpine are inert. Lactic acid and phosphoric acid cause dilatation of the muscle capillaries; CO_2 , acetic acid, and HCl are less active and less regular in their action. Alkalies cause constriction. Upon the vessels of the lung adrenaline and other substances, such as ergotin, tyramine, and isoamylamine, are without effect; CO_2 causes dilatation; alkalies produce constriction; caffeine, digitalis, alc., Et_2O , K, Ca, and Ba are without effect. Adrenaline has no effect upon the vessels of the heart nor is the circulation of this organ modified by choline, pilocarpine, acids and alkalies, or Ca and Ba. The vessels, both arteries and veins, of the intestine are dilated by acetylcholine, constricted by adrenaline. Atropine is without effect upon the normal vessels, but if applied after a previous treatment with choline it causes contraction. Acids (lactic, CO_2) are without effect; alkalies in high concn. cause constriction. Ca and Mg dilate the intestinal vessels; K causes prompt contraction. The effect of choline is largely detd. by the relation between K and Ca. Adrenaline is effective in the liver and spleen. Acids are without effect upon the circulation of the liver. Adrenaline constricts the vessels of the kidney and the adrenal although in these organs the reactions are complex. Choline, pilocarpine, and atropine are inert, as are Ca, Mg, acids and alkalies. K produces dilatation, as does caffeine to a slight degree. G. H. S.

The effects of Roentgen rays and radioactive substances on living cells and tissues. LEO LOBB. *J. Cancer Research* 7, 229-82(1922).—A critical review of the literature with bibliography. H. G. WELLS

The influence of inorganic salts upon tumor growth in albino rats. KANEMATSU SUGIURA AND S. R. BRNEDICT. *J. Cancer Research* 7, 329-69(1922).—The possible therapeutic value of orally administered inorg. salts for the Flexner-Jobling rat carcinoma has been studied. The study included 32 different inorg. salts. CuSO_4 , As_2O_3 , K_2CO_3 , and CaCl_2 showed a retarding influence upon the growth of the tumor, but such action is not marked. CuSO_4 is the most effective agent in this respect, and appears to have some immunizing action against the tumor. Te nitrate and selenic acid have a very marked toxic action upon rats; but these compds. show no influence whatever upon the proliferating power of the tumor cells. MgCO_3 and MgCl_2 show a slight but distinct accelerating influence upon the tumor growth. H. G. WELLS

Does the reaction to adrenaline obey Weber's law? D. M. LYON. *J. Pharmacol.* 21, 229-35(1923).—Repeated doses of a uniform amt. of adrenaline chloride soln. pro-

duce the same increase in blood pressure only if the resting level of the pressure immediately preceding the injection is the same in each case. When the resting levels differ, the blood pressure responses to uniform doses vary, the magnitude of the disturbance diminishing as the resting level rises. When the amt. of adrenaline administered is increased arithmetically, the resultant blood pressure rises do not follow suit but bear a logarithmic relationship to the stimulus, obeying the Weber-Fechner law.

C. J. WEST

Toxicity of carbon tetrachloride in relation to liver function as tested by phenol-tetrachlorophthalein. P. D. LAMSON AND A. J. MCLEAN. *J. Pharmacol.* 21, 237-46 (1923).—The toxic effects of CCl_4 have been studied by means of the phenoltetrachlorophthalein liver function test and also the effect on renal function by means of the phenolsulfonephthalein test. Single doses of 4 cc./kg. of CCl_4 produce functional disturbance of the liver in the dog with complete return of function to normal within 96 hrs. Signs of intoxication in these animals could be observed by this method before any visible signs or symptoms were evident. The kidneys did not appear to be effected by this dose. Administration of 2 cc./kg. produced no demonstrable effect in either liver or kidney function. Finally, 4 cc./kg. (the found toxic dose), given in divided doses of 2 cc./kg. at 48 hrs. intervals, were found to have no toxic effect, which is contrary to the belief that divided doses are more toxic than a single massive dose. C. J. W.

Salicylates. XIV. Liberation of salicyl from and excretion of acetylsalicylic acid. P. J. HANZLIK AND ELIZABETH PRESKO. *J. Pharmacol.* 21, 247-61 (1923); cf. C. A. 15, 3336.—The max. liberation of salicylic acid from, or in other words, decompn. of acetyl-salicylic acid in buffers at 38° (body temp.) was found to be about 4% at p_H 8.4, 5% at p_H 6 at the end of 1 hr.; about 45% at p_H 8 and 33% at p_H 5 at the end of 18 hrs. and almost complete (95%) in buffers at p_H 8 at the end of 24 hrs. On the other hand between 98 and 99% of the Ac acid remained unchanged at the end of 1 hr. in buffers of p_H 6.8-7; about 95% at the end of 18 hrs. in a buffer with p_H 7 and about 45% at the end of 24 hrs. in buffers with p_H 6-7. Therefore considerable absorption and urinary excretion of the unchanged Ac acid would be expected and this was actually found to be the case in a quant. study of excretion in persons. The administration of 4-14.8 g. (clinical "toxic" doses) of Ac acid to 6 persons resulted in total excretions of from 8.8 to 36.6% of the Ac acid administered. The excretion bore no relation to clinical conditions, dosage, diuresis, total salicyl excreted and other factors. The duration of excretion was 3-6 days (av., 4.75 days). This means that considerable unchanged Ac acid circulates through the body and presumably explains the differences in pharmacol. action, clinical "toxic" dosage and effects of Na salicylate and Ac acid.

C. J. WEST

I-ZOOLOGY

R. A. GORTNER

Notes on the longevity of the larvae of *Aedes calopus* (Stegomyia) deprived of oxygen of the air and living in alkaline water. M. E. CONNOR AND W. M. MONROE. *Brochure of Departamento de Salubridad Publica* (Mexico), 8 pp. (1922); *Bull. mens. office internat. d'hyg. publ.* 15, 505 (April 1923).—In anti-mosquito work it is not necessary to leave oil indefinitely on the surface of water. Ten minutes is generally enough to destroy the larvae. Not only does the oil deprive them of O, but it also acts as a poison. The aquatic period in the life cycle in alkaline solns. or in alkaline waters is shorter than normal.

JACK J. HINMAN, JR.

Agents for combating flies. W. VON SCHUCKMANN. *Z. angew. Entomologie* 9, 81 (1923); *Arb. Reichsgesundh.* 53, 595-618 (1923).—Various materials, some proprietary, were tested as insecticides for adult and larval flies. The efficiency of borax and FeSO_4 was confirmed. The toxicity of milk of lime was enhanced by the addn. of cresol soap soln. As sprays for adult flies, cresol soap soln. (5%), a mixt. of tincture of pyrethrum, green soap glycerol and CCl_4 and a mixt. of cresol soap soln. (3%) and formalin (2.4%) were effective. Several fumigants were of no value. Other control measures were tested and recommendations for a practical control procedure are given.

CHAS. H. RICHARDSON

Initiation of development in the egg of *Arbacia*. I. Effect of hypertonic sea water in producing membrane separation, cleavage and top-swimming plutei. II. Fertilization of eggs in various stages of artificially induced mitosis. III. Effect of *Arbacia* blood on the fertilization reaction. E. E. JUST. *Biol. Bull. Marine Biol. Lab.* 43, 384-412 (1922).

L. W. RIGGS

Intervention of the spleen in the phenomena of adaptation to the changes in salinity. Mlle. FRANCE GUYLARD. *Compt. rend.* 176, 917-9 (1923).—In the stickleback (*Gas-*

terosteus aculeatus var. *leiurus*) the wt. of fresh spleen per 100 g. of total fish was 0.535. This species is noted for its adaptability to changes in salinity. In 5 other less adaptable species the corresponding wt. ranged from 0.065 to 0.270. These figures were averages of a large no. of detns. If the stickleback is placed in water of its natural habitat and 20 g. per liter of NaCl is added, at the end of 15 min. the wt. of the spleen has fallen from 0.535 to 0.356 per 100 g. of fish, in 2 hrs. to 0.266, in 24 hrs. to 0.222, and in 3 days to 0.215. The min. is reached in about 24 hrs. when the spleen has lost approx. half its wt., and thereafter it changes in wt. but slightly. Sticklebacks placed in water contg. varying amts. of NaCl and the spleens weighed at the end of 24 hrs. gave the following figures: with 5 g. NaCl per l. 0.475 per 100 g. of fish, 10 g. NaCl 0.300, 15 g. NaCl 0.230 and 20 g. NaCl 0.222. Spleens from fish which have sojourned in the salted water are flabby, the color normally brownish red changing to reddish yellow. These changes are more marked as the concn. of the salt soln. or the time of sojourn therein is increased. The change in the wt. of the liver during a 24 hour sojourn in water contg. 20 g. NaCl per l. was from 4.35 to 4.20 g. or 0.15 g. per 100 g. of fish. L. W. R.

Impermeability to urea of various tissues of Selachian fishes. MARCEL DUVAL AND P. PORTIER. *Compt. rend.* 176, 920-1 (1923).—Individuals of the species *Scylium canaliculus* were placed in aq. solns. of urea of varying concn. for 2 hrs. The f. ps. of the urea solns. (external medium) were -0.36 , -0.54 , -0.81 , -1.26 , -1.50° and the corresponding f. ps. of the blood of the fish (internal medium) were -1.53 , -1.85 , -1.60 , -1.92 , -1.82° . The gills and teguments of *Selachians* appear nearly impermeable to urea in the sense of the external medium towards the internal medium. L. W. R.

Physico-chemical properties of the constituents of the sea urchin. FRED VLES, MILLE G. ACHARD AND D. PRIKELMAIER. *Compt. rend.* 176, 1179-81 (1923); cf. C. A. 17, 1674.—An emulsion of the eggs of *Paracentrotus lividus* Lk. was subjected to cataphoresis in sea water of varying p_H . The living normal egg of the sea urchin appears, according to its interior p_H , in equil. with the immediate surroundings at the isoelec. point of one of its principal complexes, else the isoelectric point represents the min. of a large no. of physicochem. properties of the proteins. L. W. RIGGS

Enzymes in the digestive organs of the honeybee. F. SARIN. *Biochem. Z.* 135, 59-74 (1923); cf. C. A. 15, 3643.—Lipase, pepsin, trypsin, rennin and amylase are found in the stomach only. Inulinase, lactase, and emulsin are entirely lacking. Concerning invertase cf. following abstr. Glucose is the end-product of amylolytic activity. In the latter half of the winter catalase is found in the large intestine as well as in the stomach. It is not found in the small intestine or its contents, and furthermore it is found in the wall of the large intestine after the contents are completely removed. It follows that catalase is produced in the wall of the large intestine. The necessity for intense oxidative processes to cope with the accumulation of fecal material in the intestine which, despite continuous food ingestion, is not emptied in winter, accounts for this catalase production. GEORGE ERIC SIMPSON

Further studies on the invertase of the alimentary tract of the honeybee. E. SARIN. *Biochem. Z.* 135, 75-84 (1923).—Invertase is found in the stomach of the bee, but not in other parts of the alimentary tract. Exts. of the stomach made in the late fall and early spring contain no invertase, although other enzymes investigated show no variation at these seasons. At these times the bee feeds on honey contg. only invert sugar, hence invertase is not required. The mode of prepn. of the invertase is investigated. Activity of the exts. is not enhanced by rubbing up the material well before extn. (cf. preceding abstr.). The amt. of sugar inverted varies with the concn. of the ext. in the digesting mixt., but there is no strict proportion. Over 10% glycerol in the digestion mixt. retards inversion. Aq. exts. soon decompose. Equal parts glycerol and H_2O give an ext. which retains its activity undiminished for 11 mos. G. E. S.

Nitrogenous compds. in the flesh of *Mactra sulcataria*. Desh. KIYOHISA YOSHIMURA. *J. Chem. Soc. Japan* 44, 53-7 (1923).—From 14 kg. of the fresh flesh of *Mactra sulcataria* the basic nitrogenous compds. were sepd. by the usual method of phosphotungstic acid pptn. The following compds. were isolated: 0.8 g. (as HCl salt) of Me_3N , identified by picric acid salt (m. 216°), Au double salt (decomp. 245°) and Pt salt (decomp. $230-5^\circ$); 19.7 g. (HCl salt) of betaine, identified as Au salt, (m. 248°), Pt salt (m. $245-6^\circ$) and picrate (m. $181-2^\circ$); 2 g. (as HCl salt) of carnitine, identified by Au salt, (m. $143-50^\circ$), Pt salt (m. 213°); and 1.5 g. (as NH_4Cl) of NH_3 . The detailed methods employed for sepn. of the above compds. are given. S. T.

12—FOODS

W. D. BIGELOW AND A. E. STEVENSON

The production of protein for food purposes and human nutrition by Pohl's process. GEORG SCHEUMANN. *Mit. deut. Landw.-Ges.* 38, 271-2(1923).—Pohl's process consists in extg. the protein from lupines with salt water from which it is pptd. by certain reagents, washed, dried, and obtained as a yellowish white powder, 98-99% pure. In Germany this material is replacing egg albumin formerly obtained from China. S. proposes to utilize the residue from the salt water extn. as a stock food by mixing and drying with one third molasses. The product contains 10% H₂O, 28.22% crude protein, 23.59% pure protein, 5.17% fat, 43.41% N-free ext., 10.6% crude fiber, 2.6% ash, and 0.051% alkaloids. It is claimed to be remarkably stable. K. D. JACOB

Absorption and retention of hydrocyanic acid by fumigated food products. E. L. GRIFFIN, I. E. NEIFERT, N. PEKRIE AND A. B. DUCKETT. U. S. Dept. Agr., *Bull.* 1149, 1-16(1923).—The amt. of HCN absorbed by food products when fumigated under ordinary conditions, and also the rate at which it is given off when the products are exposed to the air, is shown by the analysis before and after exposure of a large no. of fruits, vegetables, seeds, flour and other foodstuffs. All the products examd. absorbed the fumigant to some extent. Hard rinds of vegetables or skins of fruits had a tendency to decrease the absorption while chlorophyll-bearing vegetables or those of a succulent nature took up large quantities of the gas. The flour examd. absorbed a large quantity of HCN, but all was dissipated in the course of a week. Seeds also gave up rapidly at first the greater part of the HCN absorbed but a small amt. remained for several months. No conclusions are drawn as to the safety of fumigated foods for consumption. W. H. ROSS

Standard methods of milk analysis. R. S. BREED. *Sci. Proc. Soc. Am. Bact.* Sept. 1922, *Abstracts Bact.* 7, 85.—A brief report is given indicating the present status of routine analytical methods for the analysis of milk standardized by the Lab. Section of the Am. Public Health Assoc. H. G.

Bacteriological and chemical methods for testing milk. WILLY BORCK. *Centr. Bakt. Parasitenk., II Abt.* 54, 127-9(1921).—Besides enumerating the no. of bacteria per cc. milk was also judged by measuring its reducing action on methylene blue and by testing for the presence of NH₃ by means of ICl₃. In many samples of milk the results with these tests had no relation to the no. of bacteria present. JULIAN H. LEWIS

The total solids content of milk; by calculation and by analysis. KOESTLER AND A. BAKKE. *Le Lait* 3, 112-8, 200-5(1923).—The formulas of Fleischmann and Ackermann are reviewed as to their value in calcg. the total solids of milk when the fat content and sp. gr. are known. K. and B. find, using the Roese-Gottlieb and Gerber methods for detg. fat, a value for the const. S^2 of 1.6393 for autumn milk, and 1.6530 for spring milk. The agreement between the calcd. and the detd. values for the total solids content shows an av. of 0.31 for the autumn milk, and 0.45 for the spring milk, the calcd. values being arrived at by use of the Fleischmann formula. The calcd. values are in each instance larger. Because of the time consumed in making the analysis the authors have introduced a correction for possible citric acid destruction. H. F. ZOLLER

Pasteurization of milk with electricity. G. COLUMBIEN. *Lait* 3, 332-4(1923).—Milk is heated to pasteurization temps. by the resistance it offers to the passage of an elec. current at 3000 volts. Practical runs were made on the market milk of Amsterdam, Holland. Both flash heating to 70° and the holding method at 63-64° were employed with success; the latter yielded a product of better flavor. The bacterial count was reduced to about 25,000 per cc. as a max. Expts. with 220 v. at electrodes are expected to yield better results. H. F. ZOLLER

Nut margarines. J. T. KRISTER. *J. Assoc. Official Agr. Chem.* 6, 502-8(1923).—Numerous references and statistics are given; also an elaborate table of the analyses of 15 samples representing 15 different brands of nut margarines. These cover the ordinary "crude" analysis, consists. of the fats, and qual. tests for peanut and cottonseed oil. Special care is necessary in the prepn. of the sample in order to obtain concordant moisture results. The results show considerable variation in compn. and proportion of the fats used, as revealed by wide ranges in certain phys. and chem. characteristics. The official methods for water, fat, curd, and salt were found applicable to this product. Results on peanut oil by Evers' modification of Bellier's method (cf. C. A. 7, 662) indicate that this method can, with experience, be made to give results that are approx. quant. when applied to nut margarine. J. A. KENNEDY

Report on baking powder. L. H. BAILEY. *J. Assoc. Official Agr. Chem.* 6, 445-57 (1923).—Results from 2 collaborators on the electrolytic detn. of lead (cf. C. A. 15, 3880) are given. Further study of this method is recommended. The following indicators and combinations of them were studied: phenolphthalein, thymolphthalein, thymol blue, and methyl red. Tables showing results with these indicators were given. Of these, the combination of phenolphthalein (0.5% alc. soln.) and thymolphthalein (0.04% alc. soln.)—half and half—is preferred. It gives a better end point than either alone. The indicator should be made up with accuracy and measured by means of a pipet graduated in tenths. The neutralizing value of CaHPO_4 .—Of the two methods studied, the following was recommended as the tentative method: Weigh 0.84 g. of CaHPO_4 into a 150 cc. beaker. Add 25 cc. of water and 10-15 drops of phenolphthalein (1% soln.). Titrate with 0.5 N NaOH to a faint pink; then heat to boiling, boil one min. and titrate while hot to a faint pink again. (Add bulk of alkali rapidly with vigorous stirring.) Total buret reading $\times 5$ = neutralizing strength of 100 parts of phosphate in terms of bicarbonate. Volumetric methods for the detn. of CO_2 .—Two methods, each with photographs of app., are submitted for collaborative study. Both of these are too long for abstracting. It is recommended that the accuracy of these methods be compared with the official absorption methods. J. A. KENNEDY

Report on fluorides in baking powder. J. K. MORTON. *J. Assoc. Official Agr. Chem.* 6, 457-60 (1923).—This is a report on the collaborative study of the Wagner-Ross method (cf. C. A. 12, 29). Results are submitted and the method is again recommended for further study. J. A. KENNEDY

Physicochemical properties of strong and weak flours. III. Viscosity as a measure of hydration capacity and the relation of the hydrogen-ion concentration to imbibition in the different acids. R. A. GORTNER and P. F. SHARP. *J. Phys. Chem.* 27, 481-92 (1923).—The viscosity method offers a rapid method for the measurement of the relative imbibitional capacity of the gluten colloid of flours. The same max. viscosity is not reached when mixts. of flour and water are treated with various amts. of different acids. The H-ion concn. at which the various acids produce their max. imbibition is approx. the same, and is roughly at a p_H of 3.0. The order of the acids arranged according to their ability to produce max. imbibition is different with 2 flours. R. B.

The causes of the deterioration of brown war bread. MICHELE D. ATTI. *Ann. scuola agr. Portici.* [2] 15, 1-42 (1919).—The deterioration was found to be due to the tempering of the wheat used which, as a result of the absorption of water by the outer layers of the caryopsis, gave rise to fermentative processes with the production of acids in the bran retained in the flour. ALBERT R. MERZ

Determination of fat in alimentary paste, flour and dried egg. R. HERTWIG. *J. Assoc. Official Agr. Chem.* 6, 508-10 (1923).—Detns. by direct extn. with dry Et_2O gives low results. The following method is given: Place 2 g. of ground sample in a 50 cc. beaker, add 2 cc. of 95% alc., and stir so as to moisten all particles. Add 10 cc. HCl (1.125), mix well, immerse the beaker in a water bath held at about 65°, and stir at frequent intervals for 15-25 min., or until the proteins and starch are sufficiently hydrolyzed to form a clear soln. Add 10 cc. of 95% alc. and cool. Transfer the mixt. to a Rührig tube or a Mojonier fat extn. tube; rinse out the beaker with 25 cc. of washed Et_2O , in 3 portions, and shake well. Add 25 cc. of redistd. petroleum ether (b. p. below 60°) and mix well. From here proceed as directed under the official Roes-Gottlieb method for fat in milk, re-extg. twice more with 15 cc. of each ether. The method is believed to be applicable also to bread and bakery products. Results are given. This method should be found very useful in calcg. the egg content of noodles from their fat content after the av. percentages of fat in flour and eggs, by the proposed method, have been established. J. A. KENNEDY

Nutrition studies of some new varieties of citrus fruits and avocados. M. E. JAFFA, et al. *Calif. Avocado Assoc. Ann. Rept.* 1921-1922, 58-64; *Expt. Sta. Record* 48, 159.—Proximate analyses are reported of the tangelo, a hybrid produced between the pomelo and the tangerine; the orange-lemon hybrid; and the citrange, a hybrid between a common sweet orange and the trifoliate orange. These analyses show that the acid content of the tangelo approaches that of the grapefruit, and that the percentage of sugar is only slightly higher than that of the grapefruit. In the orange-lemon hybrid the acidity and sugar content correspond to that found in the lemon, while the phys. characteristics resemble those of the orange. The citrange in its content of sugar and acid is halfway between a lemon and an orange. H. G.

Composition of some indigenous grasses. A. J. TAYLOR. *S. African J. Sci.* 19, 218-32 (Dec. 1922).—About 35 species, representing 20 genera collected during the early flowering period, were analyzed for ash, P_2O_5 , crude fat, crude fiber, crude protein, true

protein, amides, etc., sol. carbohydrates and calorific value. The species were arranged in 4 tables according to the percentages of crude fiber, calorific value, crude protein and true protein, resp. Individual and seasonal variations in compn. are discussed. Crude fiber content affords the best criterion for detg. the relative feeding values of grasses, this value being in inverse ratio to the fiber content. Microscopic examn. of a cross-section of the leaf shows approx. the fiber content. The less sclerenchyma shown in a section the higher the feeding quality of the grass. L. W. RIGGS

Production of CO_2 and volatile acids by propionic acid bacteria with special reference to their action in cheese (SHERMAN, SHAW) 11C.

Standard Methods of Milk Analysis. 4th Ed. Revised and enlarged. New York: American Public Health Association. 40 pp. 40 cents.

Preserving fruit juices. W. T. MCGEORGE. U. S. 1,458,427, June 12. Juice of oranges, lemons, limes or other fruits is agitated with hydrated Al silicate, the silicate and adsorbed substances being then removed by centrifugal force applied to such a degree as to leave the juice hazy or cloudy. This treatment serves to remove oxidizable and coarse suspended matter and is followed by pasteurization and bottling. Gelatin or other protective colloids may be added.

13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

The laboratories of the Fabrique Nationale d'Armes de Guerre at Herstal-lez-Liège. HENRI POMMERENKE. *Rev. métal.* 20, 273-306(1923).—A detailed and profusely illustrated description. A. PAPINEAU-COUTURE

Lessons from the Granite Mountain shaft fire, Butte. DANIEL HARRINGTON. *Bur. Mines, Bull.* 188, 50 pp.(1922).—A complete report of the disaster, with suggestions for decreasing the fire hazard in mines and for fighting fire and fumes. H. L. OLIN

The removal of small amounts of carbon monoxide from gases by passage through heated granular soda lime. R. E. WILSON, C. A. HASSLACHER AND E. MASTERSON. *Ind. Eng. Chem.* 15, 698-701(1923).—Above 400° soda lime with high Na content gave practically complete removal of CO from a CO-N_2 mixt. contg. 2% CO. Low Na soda lime or straight lime gave much poorer removal. F. C. Z.

Preferential oxidation in presence of catalysts. REX FURNESS. *Chemistry & Industry* 42, 196-9(1923).—A description of recent developments in preferential catalytic oxidation, particularly of the partial oxidation of H_2S in fuel gas to S and H_2O , and of hydrocarbons to resins, soaps, lubricating oils, internal combustion fuel, etc. C. C. DAVIS

The solvent properties of acetone. R. F. REMLER. *Ind. Eng. Chem.* 15, 717-20(1923).—The advantages of acetone over other common solvents are set forth, as well as its technical uses as a solvent. R. gives results of exptl. work carried on at the Mellon Institute in which was detd. the solvent action of acetone on numerous natural resins, oils, fats, greases, mineral lubricating oils, asphalts, bitumens, essential oils, gums, waxes, rubbers, gutta percha, balata and pontianac. E. G. R. ARDAGH

Methods of costing in chemical works. F. M. POTTER. *Chem. Age* (London) 8, 588-9, 612-5(1923). E. J. C.

The relation between molecular structure and elastic properties of engineering materials. H. MARK. *Electrotechn. u. Maschinenbau* 41, 265-7(1923). C. G. F.

Reflections on patents. HOWARD CHEETHAM. *Chemistry & Industry* 42, 579-80(1923). E. J. C.

Steam accumulator (GINSBERG) 1. Some factors affecting the accuracy of Saybolt viscosity measurements and their control (KLOPSTEG, STANNARD) 1. The sludge formation in transformer oils (STAGER) 22. Lubricating value of cod-liver oil (ROSE-WARNE) 22.

Annual Report of the Society of Chemical Industry on the Progress of Applied Chemistry. Vol. VII. London: Society of Chemical Industry. 586 pp.

BARR, ARCHIBALD, EWING, JAMES ALFRED and PATERSON, CLIFFORD C.: Physics in Industry. London: Henry Frowde & Hodder & Stoughton. 59 pp. 2s. 6d.

Patents—Law and Practice. Ind. Ed. 2nd Ed. 56 pp. Trade Marks—Trade Names, Unfair Competition. 3rd Ed. 46 pp. New York: Richards and Ceyer. Reviewed in *Ind. Eng. Chem.* 15, 762.

Dispersoids. H. PFAUSON. U. S. 1,458,542, June 12. A "colloid mill" with a peripheral speed of 2000 m. per min. or more is used for prep. liquid colloidal dispersions. At least 70% and usually at least 90% of the mixt. is dispersion liquid. S, H_2O and protective colloids, graphite, soap and ultramarine, cellulose, and a large variety of other substances can be suitably dispersed in this manner. The app. of Brit. pats. 179,002 and 179,003 may be used.

Drying of animal and vegetable materials. MASAKICHI AMENOMIYA. Japan. 41,487, Jan. 25, 1922. A chamber of metal is heated with a hot gas rich in N_2 obtained by complete combustion of a fuel; then the material is put in the chamber and the gas is passed for a suitable time.

14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW AND G. C. BAKER

The bacteriophagy and the self-purification of water. P. C. FLU. *Proc. Acad. Sci. Amsterdam* 26, 116-21; *Tijdschr. vergel. Geneeskunde* 8, 218-33 (1923).—Bacteriophagy plays no role in the self-purification of water. R. BRUTNER

The activated-sludge process, Withington Works. EDWARD ARDEN AND WM. T. LOCKETT. *J. Soc. Chem. Ind.* 42, 225-30T (1923).—Under suitable aeration conditions, the control of the process can be well maintained without reference to the higher organisms (protozoal and bacterial growths) contained in the sludge. The density of the sludge is dependent on the character of the sewage treated, particularly with reference to the vol. and frequency of storm water entering the sewage system; and the biological condition is more or less dependent upon the aeration period allowed with respect to the strength of the sewage treated. Dissolved-O detns. gave results in accord with those previously obtained. They clearly showed the effect (amt. of O increased with diln.) of storm water on the degree of oxygenation of the final effluent. The results obtained in the operation of the plant, both as regards quality of effluent and cost have been so satisfactory that an additional unit of 6 times the capacity of the existing plant is now under construction. G. C. BAKER

Recovery of nitrogen from sewage in the activated-sludge process. EDWARD ARDEN, CLARENCE JEPSON AND PERCY GAUNT. *J. Soc. Chem. Ind.* 42, 230-4T (1923).—There is usually some loss of total sewage N during treatment by the activated-sludge process, the recovery being most nearly quant. in the absence of vigorous nitrification. Variations are largely attributed to the changeable biological condition of the sludge, depending upon character of sewage treated and the extent and means of aeration. Any excess of N recovered of that in the gross suspended sewage solids must be due to flocculation of the sewage colloids, which contain a higher percentage of N than the coarser particles. There is little evidence of fixation of atm. N or adsorption or fixation of sol. NH_4 salts. Increased N content of activated sludge is not necessarily due to the high N content of higher organisms present. G. C. BAKER

Annual reports of the Division of Water, Division of Sewage Disposal and Bureau of Water Works Extension for the year 1922. C. B. HOOVER. *Columbus City Bull.* Suppl. 7, No. 17, 24 pp. (1923); cf. *C. A.* 17, 2022.—During the yr. storage for raw city water was increased 500 mil. gals. 8,030 mil. gals. of H_2O were softened and purified. The use of $Ca(OCl)_2$ has been discontinued and a liquid Cl-app. installed. 8 new filters, enlargement of filtered water reservoir, and construction of a new filtered- H_2O suction conduit and a new wash- H_2O drain were practically completed during the latter part of the yr. The distribution system was increased 69,936 ft. Typhoid fever cases averaged 9 per 100,000 population and the death rate was only 1.2. 10.7 lbs. of lime and 11.5 lbs. soda ash, 2.3 lbs. of which are used to neutralize the alum added, are required to reduce the hardness 1 p. p. m. Alum is added to the H_2O at the same point as the lime and soda ash, i. e., as it enters the plant. Chemicals are added to approx. 25% (overdosed) and this is mixed with 75% undosed portion, which results in quick formation of large flocs and cryst. opts. Expts. on carbonation with CO_2 were carried out, highly carbonated H_2O being fed to the rest of the supply. The sewage tanks removed 95% by vol. of the settleable material and 57% of the total suspended solids. The consumption of dissolved O was reduced 30% and the stability value of the effluents was 2.8 above that of the raw

sewage. The sprinkling filters retained 31% of the suspended solids from the tank effluents and decreased the consumption of dissolved O 76%. The filters increased the stability 46.2 and produced 2.9 p. p. m. of N as combined NO₂ and NO₃ in the effluent.

G. C. BAKER

Recent progress in sewage-sludge dewatering. H. B. CLEVELAND. *Nation's Health* 5, 362-4(1922).

F. J. C.

Purification of waste waters by means of clay. CARRE. *Hydro aux Chaux*, No. 2, 40(1923).—A system of treatment is outlined. Cf. C. A. 16, 3989. H. B. M.

The noxious action of organic compounds in waste water from high-temperature processes. ACH. GRÉGOIRE. *Bull. soc. chim. Belg.* 32, 230-2(1923).—Waste waters from blast furnaces, coke furnaces, etc., contain reducing substances (not HCN) of unknown compn. which are extremely detrimental to fish. These substances give a ppt. with a soln. contg. 20% HgCl₂, 8% NaCl and 30% AcONa. They are decompd. by oxidation with air.

R. BEUTNER

The decomposition of Javel water in the colonies. FERRÉ. *Ann. med. pharm. coloniales* 20, 185(1922); *Bull. mens. internat. office hyg. publ.* 15, 267(1923).—Of 500 bottles of Javel water 91 burst en route to Ivory Coast and others burst on storage. Decompos. was probably due to action of chem. rays on the soln. stored in colorless bottles.

JACK J. HINMAN, JR.

The molluscan fauna of the Big Vermilion River, with special reference to its modification as a result of pollution by sewage and manufacturing wastes. F. C. BAKER. *Ill. Biological Monographs* 7, No. 2, 128 pp.(April 1922); *Public Health Eng. Abstrs.* June 2, 1923.—The effect of sewage pollution on clean-water life is graphically illustrated. In a polluted zone below Urbana, Ill., foul-water algae, slime worms and septic protozoa were found. In other streams mussels have been killed off, fish life has been destroyed, health has been menaced and nuisances have been created. Treatment of sewage is recommended, with restocking and legal regulation of shell beds.

G. C. BAKER

Typhoid fever in Paris and the culture of vegetables on the sewage irrigation fields. MARCHOUX. *Rev. hyg.* 45, 300 (April 1923).—There is some typhoid in Paris which is obviously not water-borne. It may be associated with vegetables eaten raw and grown on the fields irrigated by the city sewage. Conditions on the area, are described and more stringent regulations are recommended.

J. J. H., JR.

Chlorination of swimming-pool water. W. D. STOVALL AND M. S. NICHOLS. *Am. J. Pub. Health* 13, 478-80(1923).—Cl should be employed in connection with other well known and proved methods of sanitation, and not simply as a cure-all for all dangers from communicable diseases in swimming pools.

NATHAN VAN PATTEN

Sulfite waste liquors (CHRAMTSOV) 23.

Standard Methods for the Examination of Water and Sewage. 5th Ed. Revised. New York: American Public Health Association. 111 pp. \$1.25.

15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

Study, by means of pyridine, of the humic and the fatty materials of the soil. MAURICE PIETTRE. *Compt. rend.* 176, 1329-31(1923).—Pyridine dild. with an equal vol. of H₂O is used in the reflux extractor for the removal of free humus from the soil. The extd. sample of soil is then treated with 5 to 10% HCl to dissolve Ca and P compds., is washed free of HCl and is again extd. with the dild. pyridine to remove the combined humus. The pyridine exts. are dried and extd. with a mixt. of equal parts alc.-ether, when a fatlike residue is obtained upon evap. the solvents. Soils rich in humus contain 10 to 15 parts of fatty material to 100 of humus. Soils poor in humus may contain 40 to 55 parts of fatty material to 100 of humus. The fatty compds. appear to belong exclusively to the satd. group.

L. W. RIGGS

Ultramicroscopic organisms in forest soil. ELIAS MELIN. *Ber. bot. Ges.* 40, 21-5(1922); *Botan. Abstracts* 12, 133.—Five hundred g. of humus from a plantation of *Pinus sylvestris* was extd. with 750 cc. of distd. water at room temp. for 24 hrs. A portion of the ext. was concd. in vacuum to 1/3 its original vol. Portions of the ext. were passed through filters with fine, medium, and coarse pores and then added to culture media contg. 10% gelatin, 2% glucose and a little NH₄ citrate or a few drops of Bouillon.

The filters used were Haen's membrane type. Various bacteria present in the soil passed the coarse filter. The ext. passed through the medium filter showed no visible evidence of bacteria or other microorganisms but caused liquefaction of the gelatin, while the ext. passed through the finest filter did not cause liquefaction. M. believes the latter fact to be sufficient evidence that the liquefaction of gelatin by the ext. passed through the medium filter was not caused by enzymes present in the soil. The concd. exts. caused liquefaction much more quickly than those which had not been concd. H. G.

Investigations of the power of change of soils and its importance for soil science. H. R. CHRISTENSEN. *Nordisk Jordbrugsforskning* 1921, 200-7; *Botan. Abstracts* 12, 130.—Soils which are basic or close to the neutral point, and which show a considerable buffer action, not only give *Azotobacter* development in inoculated mannitol soils, but also break down mannitol much more vigorously than the soils lacking in buffer action, i. e., the soils which require lime. For the soils not needing lime a correlation is shown between phosphate content and mannitol decompn., detd., not by the microflora, but by the chem. compn. of the soil. Most important is the content of basic Ca compds. and of easily sol. phosphates. Comparisons with field tests have shown this correlation to be promising for a lab. investigation of the need of phosphate in soils. Only soils of basic reaction and with a certain buffer action have a considerable content of CO_2 sol. phosphates. H. G.

Arsenic and iodine in soils and subterranean water in Argentina. I. II. F. RIECHERT AND R. A. TRELLES. *Rev. Facultad Agronomía* 3, Pt. 3, 281-4, 285-7 (1921); *Bull. Agr. Intelligence* 13, 303-4.—The As content varied from 0.08 mg. to 2.25 mg. for 100 g. of air-dried soil; it was not possible to det. the relation between the amt. of As and Fe present, but the arable soils always contained As and there was no connection between their chem. compn. and their As content. The latter is highest in the upper layers and decreases with the depth. Although there is no general rule, it appears possible that some connection may exist between the amt. of As in the soils and in the subterranean waters beneath them, as has been observed in an arsenical district (North Santa Fé). I and As are constantly present in the waters of the pampas, their amt. depending on the chem. compn. of these waters, and on the geological nature of the soil. Waters contg. Cl, S and NaHCO_3 have the highest I and As content, while those coming from granitic or calcareous soils have the lowest. The I may be derived from marine deposits, but it must not be forgotten, that it is of const. occurrence in soils, atm. dust and freshwater algae, and also that all other plants are relatively rich in I, as has been shown by the researches of Gautier and others. H. G.

The microorganisms of the soil in their relation to the growth of plants. E. J. RUSSELL. *Ann. sci. agron.* 38, 49-67 (1921); *Botan. Abstracts* 12, 134-5.—R. reviews the microbiological work with soil organisms at the Rothamsted station, emphasizing Russell and Hutchinson's protozoan theory to account for the beneficial effect of partial sterilization of the soil. Studies are being made on the rate of decompn. in the soil of phenol, cresol, naphthalene, toluene, benzene, and other aromatic hydrocarbons, and a beginning has been made in the study of the comparative sterilizing efficiency of various agents and their derivs. Results show that chloromethylene benzene is more efficient than toluene, which in turn is more efficient than benzene, for 1 group of organisms reported. H. G.

New fertilizer experiments. SCHNEIDEWIND. *Mill. deut. Landw.-Ges.* 38, 139-4 (1923); cf. *C. A.* 16, 1632.—A large no. of recent plot and field expts. with different N, K_2O , P_2O_5 and lime fertilizers are summarized. The av. yields of rye, oats, potatoes and sugar beets, with NaNO_3 as 100, were: $(\text{NH}_4)_2\text{SO}_4$ 86, NH_4Cl 86, urea nitrate 80, lime-nitrogen 74, urea 71. In the same order the relative utilization of the added N was 80, 86, 83, 65, and 68. The best yields of winter grains and sugar beets on deep heavy soils were obtained when N as NH_4 salts or lime-N was applied before planting in the autumn, the poorest when applied as top dressing in the spring. Thomas meal and pptd. phosphate gave the best results with potatoes on a light sandy soil, followed in order by superphosphate, bone meal, and ground rock phosphate, the latter showing practically no results during the first 4 years after which it was about 0.4 as effective as superphosphate. Kainite gave better yields of grains than did equiv. amts. of concd. K_2O salts, this being attributed to the favorable action of the NaCl and accessory salts present in the former. Acid soils responded favorably to lime fertilization with grains, sugar beets, clover, and vetch. K. D. JACOB

Utilization of crude gas liquor for fertilizing purposes. ANON. *Gas u. Wasserfach* 66, 25-7 (1923).—The literature is reviewed on the use of gas liquor as a fertilizer and on the harmful effects of such constituents as phenol, sulfides, cyanides, and thiocyanates on plant growth. As the result of pot expts., it appears that the harmful effects of these

comps. are removed within 8 days after the liquor is applied, and that no damage need occur to plants grown on soils previously treated with the liquor. J. L. WILBY

The relative nitrifiability of different nitrogenous organic manures in some typical soils of the central provinces and Berar. F. J. PLYMEN AND D. V. BAL. *Agr. J. India* 17, 551-9(1922).—The rate of NO_3 formation in 5 typical soils mixed with various feed cakes and incubated at $30-33^\circ$ was detd. Caster cake was the most readily nitrified, followed in order by karanza (*Pongamia glabra*), sarson (*Brassica campestris*, var. Napus), linseed and tili (*Sesamum indicum*) cakes, and Mahua (*Bassia latifolia* flowers) refuse.

RUSSELL M. JONES

The fixation of phosphoric acid by the soil. G. S. FRAPS. Texas Agr. Expt. Sta., *Bull.* 304, 22 pp.(1922).—A study of the fixation of P_2O_5 from dil. K_2HPO_4 solns. by typical Texas soils revealed that, in some cases, considerable increases took place with increase of temp.; with others little effect was shown. Fixation generally increased with time of contact. Treatment with acid, removing the CaCO_3 , resulted in little effect in some cases; in others a marked decrease resulted. Ignition increased the fixing power, even when the lime had been removed by previous treatment with acid. Expts. in which columns of 850 g. of soil were treated on the surface with 1 g. acid phosphate and 100 cc. H_2O and percolated, after 24 hrs. contact, with 1000 cc. H_2O , showed that soils with a fixing power of more than 50% lost practically no P_2O_5 . Those with a fixing power of less than 50% lost considerable P_2O_5 . Similar expts. with longer periods of contact showed less loss by percolation. It is to be concluded that, under natural conditions, heavy rains would be required to cause any loss of P_2O_5 even from soils of low fixing power. The examn. of 761 surface and 651 subsoils in regard to their compn. and power of fixing P_2O_5 demonstrated that the active P_2O_5 increased with the absorbing power until the latter reached 40-60% and then decreased. The acid consumed and the CaO increased until the absorption was 60-80% and then decreased. The Fe and Al oxides, however, as detd. by Hilgard's method, increased with the P_2O_5 fixed, with a correlation factor of 0.774 ± 0.010 for the surface soils and 0.701 ± 0.013 for the subsoils. Since the correlation factor for P_2O_5 absorbed and the CaO dissolved by strong HCl was only 0.098 ± 0.024 for the surface soils and 0.060 ± 0.026 for the subsoils, it is evident that the % of Fe and Al oxides is of much greater influence upon the P_2O_5 fixed. Further work is required on the relation between fixation in the soil and its effect upon the active P_2O_5 recovered from the soil.

P. R. DAWSON

The decomposition of copper fungicides on the surface of vine leaves. E. CERASOLI. *Riv. patologia vegetale* Nos. 5-6, 70-2(1921); *Bull. Agr. Intelligence* 12, 1345-6.—Owing to atm. agency, and especially to the CO_2 in the air, the Cu compds. in mixts. sprayed on the leaves tend to become transformed into bicarbonates of Cu with the subsequent production of colloidal solns. of $\text{Cu}(\text{OH})_2$. After a given time, and under favorable condition the bicarbonates and colloidal solns. of $\text{Cu}(\text{OH})_2$, after having attained a certain chem. equil., give rise to carbonates of Cu of a different "phys. character" from that of ordinary carbonates, inasmuch as they are not affected by the CO_2 of the air; in which case, the colloidal soln. of $\text{Cu}(\text{OH})_2$, which should prevent the development of the parasite, would not again be formed. C. found that the leaves of vines suffering from mildew have an acid reaction. Conclusion: The decompn. of the Cu salts is to be attributed to very feeble acids, or acid salts, excreted by the fungus during its passage into the leaves of the vine. Such pathological acidity would easily react upon the colloidal hydroxides of Cu, (but not upon the Cu carbonates formed in the above-mentioned manner), thus giving rise to the Cu ions upon the presence of which the anticyptogamic action is supposed chiefly to depend. When these acid substances fail to find Cu in a colloidal condition on the leaves, they produce such serious functional disturbances and changes, that the physiol. equil. of the plant's economy is destroyed, and this occasions the death of the leaf or of the entire vine, that has been attacked. C. suggests that this is possibly the reason why the leaves should have at their disposal a sufficient reserve supply of efficacious Cu, that is to say, Cu in the colloidal state, before the spores of the fungus even begin to germinate.

H. G.

Preparation of copper emulsion. S. HORI. *Phytopath. Soc. Japan* 1, 43-52 (1921); *Botan. Abstracts* 11, 442.—H. recommends the Cu emulsion made of CuSO_4 , soap, and water as a most excellent fungicide, which takes the place of Bordeaux mixt. and is superior in various respects to the latter. The quantity of soap to be used varies with the quality and therefore previous to the prepn. of the fungicide a suitable ratio of each soap to the CuSO_4 must be decided by the following preliminary test. A 1% soln. of soap should be added in various amts. to a certain volume of a 1% soln. of CuSO_4 and shaken thoroughly. The quantity of soap by which a light blue emulsion contg. no pptn. or floating matter is made decides the most suitable ratio. Generally

the quantity of soap is more than 3 times that of the CuSO_4 . According to the quantity of CuSO_4 used, H. proposes the various formulas of the fungicide in Japanese measurements as in the case of Bordeaux mixt. and recommends the 5 to 8 "Momme Shiki" for most diseases. This is made of 5 to 8 "Momme" of CuSO_4 , a suitable quantity of soap detd. by a preliminary test, and 1 "To" of water. (1 "Momme" = about $\frac{1}{121}$ pound; 1 "To" = about 4 gallons.) H. describes 2 practical methods of prep. the fungicide: (1) Dissolve the CuSO_4 in 2 parts and the soap in 8 parts of water and mix; (2) dissolve the soap in a small amt. of hot water. When the temp. goes down to about 80° put the CuSO_4 crystals into the soln. and stir it vigorously to make a concd. Cu emulsion. Add hot water to the emulsion until the vol. designated by the formula is reached. The fungicide can be preserved for a while in a concd. stock emulsion. H. also gives directions for making mixts. of varying strength from the stock emulsion. H. G.

Chemical, physical and insecticidal properties of arsenicals. F. C. COOK AND N. E. MCINDOO. U. S. Dept. Agr., *Bull.* 1147, 1-55 (1923).—A chem. examn. of com. arsenicals and of the materials used in their manuf. showed that com. As_2O_3 varies in purity, fineness, apparent d. and in the rate of soln. in water; that the manuf. of com. Ca arsenate is rapidly becoming standardized; and that both acid and basic Pb arsenates are standardized and stable. Of all the arsenicals tested, acid Pb arsenate and Zn arsenate were the most adhesive, and Paris green was the least adhesive on potato foliage. The different samples of Ca arsenate tested varied widely in toxicity and the acid Pb arsenate was found more toxic than the basic salt. Several new arsenates, as the arsenates of Ba, Cu and Ba, Mg and Al were tested but did not show as high toxicity as acid Pb arsenate. It is concluded that a chem. analysis of an arsenical does not give sufficient data to judge satisfactorily its insecticidal properties, and that a toxicity study alone does not show that an arsenical is suitable for general insecticidal purposes, but both a chem. analysis and a thorough toxicity study are required in order to judge whether or not an arsenical is a satisfactory insecticide. W. H. ROSS

Expression of quantity of water-soluble arsenic present in commercial lead arsenates. C. A. KLEIN AND W. HULME. *Ind. Eng. Chem.* 15, 745-6 (1923).—In place of the customary American specifications (not more than 50% H_2O , or more than 0.75% H_2O sol. As_2O_3 , and not less than 12.5% total As_2O_3) and British specifications (not less than 14% As_2O_3 , and not more than 0.5% H_2O -sol. As_2O_3 , and when dry not less than 28% As_2O_3), the recommendation is that the undesirable H_2O -sol. As_2O_3 should be expressed as a percentage of the total As_2O_3 . Thus for the Federal Insecticide Act specification one would have "the total As_2O_3 present shall not be less than 25% on the dry material, and of the total As_2O_3 present not more than 6% shall be sol. in H_2O ." Typical analyses are appended showing that the new system would give more logical results when calcn. of the Pb arsenate for making a spray mixt. of definite As_2O_3 strength is made. W. C. EBAUGH

Calcium cyanide dust as an insecticide. H. J. QUAYLE. *J. Econ. Entomol.* 16, 327-8 (1923).—This compd. has possibilities as a fumigant for citrus scales, as a soil fumigant and a larvicide for the peach borer. C. H. R.

Calcium cyanide for chinch bug control. W. P. FLINT. *J. Econ. Entomol.* 16, 328 (1923).— CaCN_2 proved effective in expts. Further work is in progress. C. H. R.

Bordeaux mixture as a control for leafhoppers. F. A. FENTON AND J. H. TRUNDY. *J. Econ. Entomol.* 16, 314 (1923).—This fungicide has insecticidal properties for the nymphs of certain leafhoppers. C. H. R.

A control for Japanese beetle larvae in golf greens. B. R. LEACH AND J. W. THOMSON. *J. Econ. Entomol.* 16, 312-4 (1923); cf. C. A. 16, 3726.— CS_2 -soap emulsion was effective and had a stimulating action on grass. C. H. R.

Sulfuric acid for destroying weeds. G. GAROFALO. *Coltivatore* 69, 377-82 (1923).—A soln. formed by adding 10-15 l. 52° Bé. H_2SO_4 to 100 l. H_2O is sprayed over the cereal crops when these have grown to have not less than 10-12 leaves. The cereals are scarcely harmed since they have hard, erect leaves covered with a waxy substance. ALBERT R. MEKZ

The need of chemistry for the student of entomology. WM. MOORE. *J. Econ. Entomol.* 16, 172-6 (1923).—The economic entomologist should be well grounded in org. and physical chemistry. Some insecticide problems which await solution are mentioned. C. H. R.

Spreader tests on apples and peaches. L. A. SYEARN AND W. S. HOUGH. *J. Econ. Entomol.* 16, 198-201 (1923).—Casein and flour-paste spreaders did not increase the effectiveness of spray mixts. C. H. R.

Spreaders in relation to theory and practice in spraying. R. H. SMITH. *J. Econ.*

Entomol. 16, 201-4(1923).—Ca caseinate increases the efficiency of sprays for codling moth and aphids. Saponin and soaps are not as good. C. H. R.

Progress report of investigations relating to repellents, attractants and larvicides for screw-worm and other flies. F. C. BISHOPP, F. C. COOK, D. C. PARMAN AND E. W. LAAKE. *J. Econ. Entomol.* 16, 222-4(1923).—Acetone and amyl butyrate were apparently attractive. Furfural, safrol, salicylaldehyde, a number of essential oils, camphor oils and artificial mustard oil were repellent. Nitrobenzene, CHBr_3 , furfural, safrol, pyridine, sassafras oil and salicylaldehyde were effective larvicides; benzene was satisfactory for wound treatment. Dried egg when moistened and made alk. with Na_2CO_3 was an attractive bait. C. H. R.

Exhaust gases for promoting plant growth. F. RIEDEL. U. S. 1,458,595, June 12. Exhaust gases such as those from furnaces are treated with a soln. such as Na_2CO_3 and NaHCO_3 to ext. CO_2 which is afterward liberated from the soln. by heating which also drives off some H_2O vapor from the soln. A portion of the H_2O condensates and abstracts gases which would be noxious to plants and the purified CO_2 and remaining associated H_2O vapor are led around plants to be treated to promote their growth.

16—THE FERMENTATION INDUSTRIES

C. N. FREY

The preparation of wine by continuous fermentation; selection of ferments by the alcohol already formed. LUCIEN SEMICHON. *Compt. rend.* 176, 1017-9(1923).—In the natural fermentation of must, undesirable yeasts and bacteria cause changes during the first phase of fermentation which render the wine inferior in quality to that made with selected yeasts at a low temp. Five or more % EtOH prevents the development of these organisms, but not of the desirable yeast. A continuous fermentation process is described, with EtOH as an agent of selective fermentation. It consists in adding fresh must at a const. rate to wine fully fermented, withdrawing an equal amt. of partly fermented liquor and allowing the latter to complete its fermentation separately. By this process (1) fermentation is always at its max. activity; (2) the yield of EtOH is a max. in proportion to the sugar consumed; (3) the temp. is controlled by the temp. of the must added; and (4) the d. and therefore the EtOH content can be kept approx. const. by regulating the rate of withdrawal of the partly fermented wine. The process has been applied to white, red, and sweet wines, to beet ext. and is applicable to all fermented liquors. C. C. DAVIS

Denatured alcohol in Canada. II. R. F. GILMORE. *Can. Chem. Met.* 7, 155-8 (1923); cf. *C. A.* 17, 2342.—A general article on recoverability and toxicity, denatured alcs. authorized in Gt. Britain and in the U. S., alc. for motor fuel and quality and price. E. J. C.

Production of alcohol from nipa palms. B. J. EATON AND J. H. DENNETT. *Malayan Agr.* J. 11, 47-59(1923).—The yield of sap per palm is $\frac{1}{4}$ to $\frac{1}{2}$ gal. per day. The sap contains 11-15% sucrose. Alc. may be produced by natural fermentation, but to obtain the best yields it may be necessary to maintain the sap in a sterile condition and to ferment with pure yeast. The production of sugar may not be profitable on account of the rapid inversion of the sucrose in the raw juice and the difficulty in getting good clarification. C. N. FREY

German arrack. KURT BRAUER. *Chem.-Ztg.* 47, 365-6, 370-2(1923).—The prepn. of Batavian and German arrack is described. Analyses indicate that the compn. of German arrack prepd. from molasses, rice and barley offal by means of pure cultures is similar to Batavian. C. N. FREY

Discussion on microorganisms and their application to industry and research. A. C. CHAPMAN, et al. *J. Soc. Chem. Ind.* 42, 169-80T(1923).—A symposium of the use and importance of microorganisms in the various industries with proposals advocating a national institute of microbiological research. C. C. DAVIS

The application of the Kleeman decomposition method in the brewery laboratory. ROBERT HEUSS. *Z. angew. Chem.* 36, 218-9(1923).—The method of Kleeman for detg. N in org. material (cf. *C. A.* 16, 1196) is simplified for the detn. of albumin in barley. A mixt. of 1.75 g. barley meal, 7 g. K_2SO_4 , 15 cc. H_2O_2 , 29 cc. H_2SO_4 and 1 drop of Hg is heated for 45 min. and the NH_3 detd. directly in the usual way without removal of an aliquot part. C. C. DAVIS

Prevention of secondary fermentation by infection with an ester-forming mold (CHRISTOPH) IIC.

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

The crystal form of atoxyl and its characterization under the microscope. J. MELON. *Bull. acad. roy. Belgique, Classe Sci.* 8, 150-8; *Chem. Zentr.* 1923, I, 53.—Complete data for the crystallographic consts. of atoxyl are given. The crystals are monoclinic with $a = 0.986590$, $b = 1$ and $c = 1.251538$. C. C. DAVIS

A precipitating reagent for alkaloids. WALTER PARRI. *Giorn. farm. chim.* 72, 5-7(1923).—Alkaloids and many of the common amines are pptd. in neutral or dil. AcOH soln. by Na cobaltinitrite. Most of the ppts. are colored and many of them are cryst. A. W. DOX

Sodium citrobismuthate. DOMENICO GANASSINI. *Giorn. farm. chim.* 72, 29-36 (1923).—A product, $C_6H_5O_7Bi(C_6H_5O_7Na)_6$, is described. It has the advantage over previous preps. that the soln. may be heated to 120° without becoming turbid, and it is recommended for the treatment of syphilis. The method of prep. is not given. A. W. DOX

Estimation of phenols in essential oils. C. T. BENNETT AND D. C. GARRATT. *Perfumery Essent. Oil Record* 14, 138-9(1923).—As a result of expts. to det. the best ratio of oil to alkali the conclusion was drawn that the most accurate results are obtained by using 10 cc. of oil with 100 cc. of 5% KOH soln., since the error due to absorption of non-phenols is less than when 5 cc. is employed. With high percentages of phenols the difference is usually small, but whenever practicable this ratio should be adopted for all phenol-contg. oils. W. O. E.

Microchemistry in the service of pharmacy. AD. MAYRHOFER. *Pharm. Monatshefte* 4, 61-3(1923).—An address. W. O. E.

Work on medicinal plants at the Klausenburg Experiment Station. B. PETER. *Pharm. Monatshefte* 4, 63-7(1923).—(1) *Soil analysis of expl. plots.*—Results of 4 different soils under varied manipulation are reported. (2) *Silica content of certain plants.*—Among those examd. were several alleged to be useful in the treatment of tuberculosis, notably *Equisetum arvense*, *Polygonum aviculare* and *Galeopsis ochroleuca*, 5 g. of the 1st, named being shown to contain 120 mg. H_2O -sol. SiO_2 , while the same quantity of *E. maximum* had 110 mg. (3) *Ext. Ustilaginis maidis*, an ergot substitute, yielded an amorphous brown ext. showing d. 0.947, dry material 7.95%, ash 0.82%. (4) *Alkaloidal content of mildewed Hyoscyamus leaves* appears to decrease in about direct proportion to the extent of infection. Thus, totally infected leaves yielded about $\frac{1}{2}$ less alkaloid than healthy ones. (5) *Alkaloidal content of Datura stramonium during development*, as related to the seed, was found to be 0.34 for colorless unripe but otherwise well developed, 0.30 for brown, and 0.30% for ripe black seed. The fatty oil content of the same seed varied from 22 to 23%. The 1921 seed (examd. in 1922) had 0.283% alkaloid, while seedlings therefrom in their earliest stage showed 0.274% alkaloid. Seedlings collected in the summer and dried showed toward the end of Dec. only 0.13% alkaloid, thus indicating in both cases alkaloid consumption during germination. Plants developed in the best possible soil showed: roots 0.15, stems, 0.24, leaves 0.27, seed 0.30% alkaloid. (6) *Ext. of Cnicus benedictus*.—100 g. material (4 grades) yielded 19 to 35% thick ext. The article closes with a description of expts. looking to the recovery of oil from various herb litter by distn. W. O. E.

New remedies. ARNOLD HOLSTE. *Deut. med. Wochschr.* 49, 582-4(1923).—The chem. compn. phys. and chem. properties, and suggested therapeutic uses are given for a number of the new com. remedies. MILTON HANKE

Oleum rapae. ANON. *Arch. Pharm. Chem.* 30, 96-7(1923).—Lieung notes in *Apotekerforeningens Tids.* (Norw.) that Oleum rapae can be used in Liniment ammoniae camphorae and still meet all the requirements of the Pharmacopeia. Lund in *Genstand for Undersøgelser* notes that the free oleic acid in Oleum rapae combines with NH_3 to form a slimy salt, which is an excellent emulsifying agent for the oil. 3% free acid gives a thick and const. liniment. A. R. ROSE

BLAQUE, GEORGES: *Les Plantes à Thymol*. Paris: Office National des Matières premières végétales. 77 pp. F. 10. Reviewed in *Pharm. J.* 110, 482(1923).

DE JONG, A. W. K.: *De Aetherische Olien Leverend. Planten van Nederlandsch Oost-Indië en de Bereiding van haar Olien*. Amsterdam: Koloniaal Instituut. 183 pp. 3.60 florins. Reviewed in *Chemistry and Industry* 42, 477(1923).

MAYRHOFER, ADOLF: *Mikrochemie der Arzneimittel u. Gifte*. Vicuna: Urban

and Schwarzenberg, I., Mahlesstrasse 4. 284 pp. F. 12 (Swiss). Reviewed in *Pharm. J.* 110, 482(1923).

SORNET, RENÉ: *La technique industrielle des parfums synthétiques*. Paris: Gauthier-Villars et Cie. 135 pp. F. 10.

Basic calcium salt of triacetylallic acid. KENZO INAGAKI. Japan. 41,469, Jan. 24, 1922. Gallic acid (100 g.) is dissolved in 500 g. of Ac_2O , 10 g. of ZnCl_2 is added and the mixt. heated on a water bath at $70-80^\circ$ during 3 hrs. After cooling it is thrown into 2,000 l. of H_2O under agitation, filtered and dried. The 296 g. triacetylallic acid thus produced is dissolved in 1,480 g. of alc., 219 g. of pure CaCl_2 in 1,095 g. of alc. is added and then 80 g. of NaOH in 0.8 l. of alc. is gradually added under agitation and cooling. The ppt. is filtered by suction, washed with alc. and Et_2O and dried at $50-60^\circ$ *in vacuo*. The product, $3,4,5-(\text{AcO})_3\text{C}_6\text{H}_2\text{CO}_2\text{CaOH}$, is used as an astringent and for diarrhea.

Alkyl derivatives of hydrocupreine. H. THRON. U. S. 1,458,670, June 12. Hydrocupreine oxide is alkylized with a usual alkylizing reagent such as Et_3SO_4 in alk. alc. soln. and the product is treated with excess SO_2 at $(80^\circ$ for 3 hrs.) or other suitable reducing agent to obtain alkylhydrocupreine.

Purification of caffeine. AINOSUKE TANIMURA, TANEJIRO HAYASHI AND THE NIPPON CAFEIN KABUSHIKI KAISHA. Japan. 41,355, Dec. 27, 1921. The following substances are mixed with 1 part of crude caffeine in each case, made into a paste with water, dried below 100° , crushed and sublimed at $150-230^\circ$: (1) 2.5 parts of clay; (2) 2.5 parts of clay and 0.5 part of MgCO_3 ; (3) 2 parts of clay, 0.5 part of MgCO_3 , and 0.2 part of MgO ; or (4) 2.5 parts of clay and 0.2 part of CaCO_3 .

18—ACIDS, ALKALIES, SALTS AND SUNDRIES

FRED C. ZEISBERG

The marketing of phosphate rock. R. W. STONE. *Eng. Mining J.* 115, 1062-7 (1923). E. J. C.

Manufacture of activated carbon. A. B. RAY. *Chem. Met. Eng.* 28, 977-82 (1923).—R. discusses the structure of activated C. Gas-adsorbing C requires the max. adsorptive capacity per unit of vol., while decolorizing C should be highly porous and traversed by relatively large pores, thereby rendering the active C available for adsorbing colloidal particles and large mols. The fundamentals of the Chaney selective oxidation process are described. By activating suitable raw materials through a modification of the Chaney process carbons can be prepd. that possess the desired characteristics for any application. W. H. BOYNTON

Helium and its uses. J. C. McLENNAN. *Chem. News* 126, 369-70(1923). E. J. C.

The liquefaction of hydrogen and helium. II. J. C. McLENNAN AND G. M. SCHRUM. *Trans. Roy. Soc. Canada* 16, III, 181-93(1922); cf. *C. A.* 16, 2012.—A detailed description, illustrated with drawings and photographs, is given of the equipment that will soon be completely installed in the Phys. Lab. of the Univ. of Toronto for liquefying H and He. F. L. BROWNE

Dental cements. A. CHAPLET. *Rev. chim. ind.* 32, 59-64(1923).—A review. A. PAPINEAU-COUTURE

Fireproofing of wood and cloth for theater scenery. HANRIOT, *et al.* *Bull. soc. ind. nat. encour.* 134, 111-8(1923).—After a no. of tests on a no. of mixts., it was found that a mixt. composed of 6 pts. of borax and 5 pts. of boric acid in an aq. soln. gave the best results. This may be applied to the cloth by dipping or with the sizing soln. used. The mixt. does not alter the strength of the cloth in any way, and does not affect the colors used in painting the scenery excepting in the cases of a few of the very cheap and easily replaceable colors. The time of drying is also unaffected. The mixt. may be utilized for the fireproofing of cloth already painted but a test should first be made to ascertain whether the same will be harmed by the process. A list of colors used and their compn. is appended. P. D. V. MANNING

Titanium alloys and compounds (ROBINSON) 9.

Phosphoric acid and ammonia. F. G. LILJENROTH. Can. 231,570, June 5, 1923. P and N are combined directly to form nitride which is treated with H_2O to form H_3PO_4 and NH_3 .

Synthesizing ammonia. E. H. ARNOLD and W. T. Wakeford. Can. 231,668, June 5, 1923. The mixt. of N and H in going to and from the synthesizing chamber is brought into heat exchanging relation by passing under pressure through unobstructed contiguous passages having substantially the same cross-sectional area. App. is also specified.

Ammonia. I. W. CEDERBERG, M. FJELLANGER and V. GRUNER. Can. 231,670, June 5, 1923. N and H are passed under pressure in contact with a catalyst produced from complex Fe cyanides that are insol. in water and are free from sol. simple Fe salts.

Apparatus for exothermic catalytic reaction. I. W. Cederberg. Can. 231,684, June 5, 1923. An app. for the oxidation of NH_3 has a tubular catalyst chamber which is made of a series of metal rings tightly fitting together and forming annular flanges within and around the outside of the chamber.

Ammonia synthesis autoclave. E. H. ARNOLD and W. T. Wakeford. Can. 231,669, June 5, 1923.

Storing salt. A. SCHILLING. U. S. 1,458,442, June 12. Salt obtained by natural solar evapn., immediately after harvesting and while contg. associated impurities, is submerged in a confined body of satd. brine to preserve the salt in condition for subsequent easy purification.

Calcium chloride. V. M. GOLDSCHMIDT. U. S. 1,458,650, June 12. A solid unfused mass contg. CaO is treated with a gas contg. free Cl (in the absence of substantial amts. of reducing substances) at a temp. of about 350–650° (preferably 550°) to produce anhyd. CaCl_2 . U. S. 1,458,651 specifies a similar process in which CaCO_3 is used instead of CaO .

Aluminium nitrate. T. MEJDELL and O. RAVNER. Can. 232,108, June 19, 1923. In the crystn. from a soln. of $\text{Al}(\text{NO}_3)_3$ free from Fe the eventually basic liquid which is to be crystallized flows either in a thin stream or in drops into a basic, cold $\text{Al}(\text{NO}_3)_3$ soln. where the pure crystals ppt. and the impurities remain in the mother liquor.

Alumina. B. F. HALVORSEN. Can. 232,110, June 19, 1923. KNO_3 is added to the mixt. obtained by dissolving Al-contg. materials in HNO_3 and the mixt. is heated.

Monocalcium phosphate. CHUZO IMAIZUMI. Japan. 41,377, Jan. 11, 1922. When 100 parts of $\text{Ca}_3(\text{PO}_4)_2$ are mixed with 90–100 parts of H_2SO_4 of 55° Bé. $\text{Ca}(\text{H}_2\text{PO}_4)_2$ is produced in grains, and the remaining $\text{Ca}_3(\text{PO}_4)_2$ becomes a powder. The 2 salts can therefore be sepd. mechanically.

Bleaching barite. L. K. AYERS. U. S. 1,458,461, June 12. Ground barite is subjected to the bleaching action of H_2SO_4 solns. under superatm. pressure. A small amt. of HCl may be added to accelerate the bleaching.

Recovering beryllium from ores. H. S. BOOTH and G. G. MARSHALL. Can. 231,953, June 19, 1923. A halogen compd. of an alk. earth metal or alkali metal is added to a Be-contg. material, the mixt. contg. SiO_2 . The mixt. is heated to volatilize the BeCl_2 , which may be collected by sublimation. Cf. C. A. 16, 319.

Recovering beryllium from ores. H. S. BOOTH and G. G. MARSHALL. Can. 231,952, June 19, 1923. Be-contg. material is heated in anhydrous condition with a halogen at a temp. to cause the BeCl_2 to be volatilized. Cl may also be supplied to the heated mass. Cf. C. A. 16, 319.

Manufacture of hydrogen, nitrogen and carbon dioxide. JOHN HARGER. Can. 231,936, June 12, 1923. Steam is passed over Fe which it oxidizes, a reducing gas is passed over the oxidized material which it reduces and produces a spent reducing gas, and a hot reducible metallic oxide, such as that of Cu, arranged in heat interchange relationship with the Fe material, is alternately reduced and oxidized. The gases are collected and purified and the spent gas may be converted into a reducing gas by passing it through incandescent fuel.

Fixing atmospheric nitrogen. F. DANIELS and O. R. WULF. U. S. 1,458,525, June 12. A mixt. of O and N is subjected to the action of a discharge between electrodes of opposite polarity in an oscillatory elec. circuit having a frequency between 10,000 and 100,000 cycles and a voltage between 10,000 and 100,000 v., while maintaining a space between the electrodes substantially greater than the "sparking distance" so as to produce disappearing streamers between the electrodes.

Vanadium pentoxide catalyst. H. D. GIBBS. U. S. 1,458,478, June 12. In prep. catalyzers from V_2O_5 suitable for use in various reactions, the pure V_2O_5 is fused and crushed. The process is dedicated for free use.

Film from seaweeds. TORAGORO TANAHASHI, GOICHI CHIDA, KATSUHIKO WATANABE, SOJI TAKAHASHI, AND NIPPON A. G. KOGYO GOSHI KAISHA. Japan. 41,428, Jan. 24, 1922; cf. 34,980. A colloidal soln. of seaweeds in alk. NaHSO_4 soln. is pasted

on an endless rubber band, coagulated by acids, CaCl_2 , or alum soln., pressed with rolls of woolen cloth, etc., and dried as in the manuf. of paper.

Smoke-producing apparatus. J. H. HAMMOND, JR. U. S. 1,458,181, June 12. In an app. adapted to produce smoke from partial combustion of gasoline or similar fuels, the combustion chamber is provided with an opening for admitting a limited air supply and this opening is controlled by an elec. device. Cf. C. A. 17, 1311.

Apparatus for producing carbon black. C. MATLOCK. U. S. 1,458,351, June 12. A furnace is arranged to permit a free unobstructed flow of burning gases (such as those from the combustion of natural gas), burners being employed which partially burn the hydrocarbon fuel with a restricted air supply. Devices such as blowers are provided which supply the air in regulated amt. and a collecting system serves to sep. the C black produced while the products associated with it are passed through the system at a relatively high velocity.

Apparatus for producing charcoal from fruit pits or shells. S. HILLER. U. S. 1,458,410, June 12. The material to be carbonized is passed through an inclined rotating cylindrical retort in which it first passes through flame from a burner nozzle and is then exposed to the action of hot gases below the ignition temp. The app. is provided with a regulating device for controlling the amt. of O admitted and suction, scrubbing and condensing app. are attached to the retort by means of which by-products of distn. may be recovered.

Condensation products of formaldehyde and urea. F. POLLAK. U. S. 1,458,543, June 12. See Brit. 171,096 (C. A. 16, 895).

Cement containing rubber. P. C. PLASTERER. U. S. 1,458,308, June 12. Rubber, rosin and brown shellac are digested together with CS_2 to produce a semi-solid mass and this is combined with gum arabic digested with benzene to form a thick paste which is suitable for cementing cloth.

"Anti-slipping" coating for pulleys. F. A. JOHNSON. U. S. 1,458,828, June 12. Fabric coverings for pulleys are treated with a mixt. of Al NH_4 sulfate 5, sucrose 10, lampblack 10, Na_2CO_3 10, India gum 40, sheet isinglass 10, gelatin 30, flour 45 parts and H_2O .

19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

Chemical and physical characters of bentonite. E. A. THOMPSON AND A. SADLER. Can. Rept. Mines, *Summary Rept. 1921* No. 586, 73-7 (1923).—This clay when freshly exposed varies from light yellow to light olive green, with waxy luster. It is very fine-grained and has a soapy feel when wet. It swells and forms a jelly-like mass in an excess of water. Six samples from Canada and 2 from Wyoming were analyzed and 8 analyses of U. S. samples are quoted (cf. C. A. 16, 887). The Canadian samples were generally higher in SiO_2 and lower in Al_2O_3 than U. S. samples. Sp. gr., m. p., power of absorbing water and percentage of water remaining in the clay at temps. ranging from 450° to 700° were detd. There is no fixed relation between swelling properties and the quantity of combined water present. Report of the ceramic division. JOSEPH KEELE. *Ibid* 253-70; cf. C. A. 17, 1311.—The work of this division consisted mainly of a study of the raw materials used in the ceramic industries. These include clays, shales, feldspar, quartz, limestone, talc, bauxite, magnesite, etc. The kiln scum which obscures the color of facing brick was studied and methods for its prevention were described. L. W. R.

The development of high-tension porcelain insulators and the testing of same. J. F. SCHEID. *Elektrotechn. Maschinenbau* 41, 253-61 (1923).—A review. C. G. F.

Apparatus for withdrawing and cutting portions of molten glass from a furnace. C. R. LOTT. U. S. 1,458,834, June 12.

Feed trough for glass furnaces. W. G. CLARK. U. S. 1,458,522, June 12.

Light brick. KINJI KATADA AND THE SHINAGAWA SHIRORENGA KABUSHIKI KAISHA. Japan. 41,372, Jan. 11, 1922. Addition to 19,002. A mixt. of 50% coal ash (contg. 25-35% combustible matter), 30% sawdust, and 20% fire-proof clay is compressed in a mold and roasted in a suitable furnace.

Apparatus for manufacturing tile. EIICHI IKEUCHI. Japan. 41,432, Jan. 24, 1922.

Refractory material. W. A. FARISH. U. S. 1,458,913, June 12. A non-crystd. material for manuf. of crucibles or other heat-resisting articles is formed of SiC_2 44.5, cryst. graphite 20, a carbonizing binder such as tar 20, borax 4.5 and sand 11 parts.

Refractory composition. J. L. OHMAN. U. S. 1,458,723, June 12. A compn. for the manuf. of heat-resisting articles, *e. g.*, crucibles, muffles or furnace linings, is formed of cryst. Al_2O_3 68 and cryst. graphite 25 parts with a binder, *e. g.*, clay, molasses and borax. U. S. 1,458,724 relates to a compn. formed of cryst. Al_2O_3 34, cryst. graphite 25 and SiC_2 34 parts, with a similar binder.

Refractory composition. J. L. OHMAN. U. S. 1,458,725, June 12. Heat-resisting articles such as crucibles are formed of cryst. Al_2O_3 34, fused SiO_2 34 and cryst. graphite 25 parts, with a binder added. U. S. 1,458,726 specifies cryst. Al_2O_3 22, SiC_2 24, SiO_2 22, cryst. graphite 25 and a binder 7 parts.

Abrasive mixture for fitting bearings. C. P. MERRY. U. S. 1,458,772, June 12. A mineral abrasive such as "lime quartz" is mixed with white lead, lampblack, Zn and H_3BO_3 .

Abrasive disks. S. M. BULLOCK and H. S. LLOYD. U. S. 1,458,322, June 12. Abrasive disks adapted for grinding are prepd. by wetting a fabric disk and then applying a mixt. of carborundum or other abrasive with calcined magnesite and MgCl_2 soln.

20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

Calcium chloride and cement. F. KILLIG. *Zement* 11, 487-9, 490-500, 507-9, 515-6(1922); *Chimie et industrie* 9, 968(1923).—K. studied the influence of CaCl_2 on the following cement: SiO_2 20.11, R_2O_3 11.50, CaO 62.83, MgO 0.68, SO_3 1.44, loss on ignition 2.45%. The expansion tests was made with a LeChatelier mold. Pure cement gave zero expansion; addn. of 1% CaCl_2 gave a deviation of 6 mm. of the LeChatelier needles; and the expansion decreased with increasing amts. of CaCl_2 . The time required to begin to set varied from 3.25 hrs. with 1% to 2 min. with 6% CaCl_2 ; and the time required to set completely varied similarly. For a given CaCl_2 content expansion decreases with increase in fineness. Tensile and crushing strength pass through a max. at 2% CaCl_2 .

The chemism of the hardening of Roman dolomitic cements; crystalline forms of hydrate of magnesia; colloidal form of hydrated lime. M. VON GLASENAPP. *Zement* 11, 489-92, 509-10(1922); *Chimie et industrie* 9, 968(1923).—Pulverized MgO , obtained by burning magnesite at a moderate temp., sets when mixed with water, the setting being quicker the lower the burning temp. The hydrated product can still be scratched with a finger nail after 48 hrs., but it slowly hardens. Hardening of calcined magnesite, as observed under the microscope, is due to the transformation of coarse MgO crystals into fine crystals of hydrate; but as combination with water is much quicker than crystn. there must be formed as intermediate compd. an amorphous hydrate more sol. in H_2O . In com. mortars the transformation of MgO is confined to the formation of fine crystals of hydrate in and on the fine grains of cement and at the surface of the grains of sand to which the hydrate adheres. But in lab. preps. hydrated MgO assumes a surprising variety of forms. G. has even observed one having the appearance of a gel consisting of fine droplets of the same size and shape as yeast cells. A. P.-C.

The setting and hardening of cements. S. N. BROWN. *Chem. Trade J.* 72, 127-8(1923).—The formation of a hard mass from powdered solids and H_2O may occur as follows: (1) Crystn. of the substance; (2) desiccation of colloidal, semi-solid mass or "gel"; (3) a chem. reaction between 2 or more substances in H_2O giving either a cryst. or colloidal product or both. Burned gypsum or plaster of Paris is an example of (1), CaO mortar and clay of (2) and Sorrel cement of (3). K_2SO_4 accelerates setting of gypsum, while borax retards it. K_2SO_4 retards setting of portland cement and CaO . The speed of setting of portland and hydraulic cements is increased by presence of larger amt. of Al_2O_3 . Because it withdraws Al_2O_3 from soln. gypsum retards setting of cement. Cements made from stationary kilns contain ash from fuel. Salts present in the ash retard setting. Rotary-kiln cements set more quickly because of absence of ash and 1-2% of gypsum is usually added to retard setting. Nearly 50% by vol. of hardened portland cement of normal fineness consists of unaltered particles and could easily be replaced by sand. This emphasizes the importance of having cements finely ground. Formation of CaCO_3 has very little effect on hardness of cement.

Hydraulic binding materials. I. Cement. E. BERL and W. URBAN. *Z. angew. Chem.* 36, 273-6(1923).—The simple systems CaO-SiO_2 , $\text{CaO-Al}_2\text{O}_3$ and $\text{SiO}_2\text{-Al}_2\text{O}_3$ were studied, not in a homogeneous, fused state, but in a heterogeneous condition at low temps. The components were prepd. in amorphous form with max. ratio of area to wt., and with max. reactivity; then intimate mixts. of these were allowed to harden and the

crushing strength was detd. SiO_2 contg. 49% H_2O was prepd. from Na silicate and HCl ; Al_2O_3 contg. 35% H_2O was prepd. by pptn.; CaO was used in the form of powd. hydrated lime. Cubes contg. SiO_2 and CaO in the mol. ratio 1:1, 1:2 and 1:3, and similar mixts. with the addition of sand to make mortars, showed crushing strength a max. for the mono- Ca silicate and a min. for the tri- Ca silicate, both on specimens that had been kept in a moist closet for 28 days and on those that had been kept for 3 days after treatment in an autoclave at 15 atms. for 8 hrs. Specimens with mol. ratios of $\text{CaO}:\text{Al}_2\text{O}_3$ 1:1, 2:1, and 3:1, show max. crushing strength for the tri- Ca aluminate, and min. for the mono- Ca aluminate. For $\text{SiO}_2:\text{Al}_2\text{O}_3$ in mol. ratio 1:1 there was little apparent binding power, except when the specimens were allowed to lie in alk. water, and then it was but small. For the complex mixt. $\text{CaO}:\text{SiO}_2 + 2.5\text{CaO}:\text{Al}_2\text{O}_3$ there were greater crushing strengths than for either pair taken separately, showing that the mixt. "reacts hydraulically" better than do the simple compds. Tables, curves and diagrams substantiate these conclusions. Zeolite (permutite) was then chosen as an amorphous $\text{SiO}_2\text{-Al}_2\text{O}_3$ complex, and its behavior with CaO noted. The permutite, $\text{Na}_2\text{O}:\text{Al}_2\text{O}_3:3\text{SiO}_2$ (3.5 to 5) H_2O , was dried, powd., mixed with sand, and treated with increasing quantities of CaO . The superior limit of strength was reached with 3 to 4 mols. of CaO to 1 mol. of permutite. A reverse of this process, i. e., replacing Ca by Na in the above products, did not take place. Evidently a secondary reaction had taken place, with the formation of Ca silicates and aluminates. Studies on the action of water (vapor) showed that $\text{Ca}(\text{OH})_2$ and $\text{Ca}(\text{OH})_2\text{-H}_2\text{O}$ were unquestionably formed from CaO , and that similar points of inflection of curves were found in unsound cement, and less marked resemblances in good cement.

W. C. EBAUGH

Reduction phenomena in the clinkers from shaft kilns. G. HÄGERMANN. *Zement* 11, 480-1, 492-4, 500-2 (1922); *Chimie et industrie* 9, 968 (1923).—Clinkers obtained in an oxidizing atm. are dark green to black, while those obtained in reducing atm. are brownish yellow, white, or greenish. Cement obtained from the latter sets rapidly, but after hardening has a disagreeable color owing to reduction of Fe_2O_3 to FeO , which combines with SiO_2 . FeO acts as a base, whereas Fe_2O_3 acts as an acid in its combination with CaO . These clinkers generally contain some S as sulfide or sulfate. Sulfide colors the cement and gives green stains with water, which gradually turn yellowish brown in air. Analysis shows these clinkers contain alkalies, which accounts for the rapidity of setting. White clinkers are always present in small quantities and are formed at points where there is an accumulation of lumps of coke; they have a porous structure and contain metallic inclusions.

A. PAPINEAU-COUTURE

Drying of plaster and its conservation in humid air. PIERRE JOLIBOIS and PIERRE L'ÉFÈVRE. *Compt. Rend.* 176, 1476-8 (1923).—Plaster dried above 300° loses the property of setting in contact with H_2O , its absorptive power tested by I vapor diminishing with increase of drying temp. Dried at low temp. it darkens rapidly in I vapor; heated to 500° it becomes pale rose; at 800° drying it remains colorless after a month's exposure in a desiccator satd. with I vapor. Sensible heat evolution in transformation by drying was registered photographically with the double galvanometer of LeChatelier and Saladin. A current of air satd. with H_2O vapor at 0° and 15° was passed over a small boat contg. about 0.5 g. plaster and wt. increase detd. Plaster dried between 150° and 300° absorbs H_2O rapidly; when the content of demi-hydrate exceeds 2% the speed diminishes. With very moist air the absorption proceeds much more slowly and is quickly limited to an amt. corresponding to a content less than the demi-hydrate.

HOWARD E. BATSFORD

Report of the Road Materials Division. HENRI GAUTHIER. Can. Dept. Mines, *Summary Rept.* 1921, No. 536, 271-318 (1923).—A general survey of Canadian road materials is given, and many phys. and granulometric tests on gravels and other road and building material are reported.

L. W. RIGGS

Fireproofing of wood and cloth for theater scenery (HANRIOT, *et al.*) 18.

Preparing aggregate for concrete. C. L. BOURNE. U. S. 1,458,387, June 12. Gravel or rock associated with softer materials such as soft rock, shale, clay or dirt is subjected to impacts of such regulated force as to break up materials of less than a detd. standard of hardness and facilitate sepn. of the materials of different hardness.

Sound-absorbent plaster. P. E. SABINE. U. S. 1,458,631, June 12. Granular particles of slag or the like of irregular shape are employed such that voids will be left between the particles and a bonding material such as "Sorel cement" is used which will not completely fill the voids.

21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

The combustion of gaseous fuels. G. F. MOULTON. *Ind. Eng. Chem.* **15**, 583-6 (1923).—Observations of flame characteristics with respect to "hardness" and to height of cone, and results of tests for completeness of combustion show that gaseous fuels ranging in thermal value from 400 to 600 B. t. u. should give service of practically equal value when used with standard burners, provided the rate of supply of potential heat units is const.

Dynalkol new fuel in Czecho Slovakia. ANON. *Oil & Gas J.* **22**, No. 2, 133 (1923).—"Dynalkol" is a mixt. of alc. and C_6H_6 to which is added 1% naphthalene, 1% tetralin or 5% of ether. The alc. content is up to 45%. It is claimed that much difficulty from fouling the engine has been experienced with this fuel. D. F. B.

Fuel oil in a Rhode Island central station. N. STAHL. *Elec. J.* **20**, 210-3 (1923); 9 illus.—The fact that fuel oil can be burned with less excess air than coal on underfeed stokers led to higher furnace temp., 1500° vs. 1200°, with an increased deterioration of furnace lining. But this latter condition has been greatly offset by cooling the furnace walls with the air which enters the combustion chamber. The Rhode Island 15,000 h. p. plant operates under oil-fired conditions with an av. of between 12 and 15% excess air, while the av. for coal-fired furnaces was about 35%. To prevent the formation of excessive scale in lower boiler tubes the water must be chemically treated. The most serious disadvantage of the use of fuel oil has been found to be in the reduced superheat as compared with coal-fired operation, the drop being about 20° to 22°. The cost of the entire oil-burning installation, including storage and service tanks, labor and overhead is \$17. per rated h. p. or \$3.70 per kw.

Motor and aviation spirit. ANON. *Petroleum Times* **9**, 771-2 (1923).—The British specifications are listed.

Distillation curve becoming generally used as motor fuel index. J. C. CHATFIELD. *Nat. Petroleum News* **15**, No. 23, 34-6 (1923).—Twelve distn. curves of typical motor fuels, including pure gasoline and various blends, are given with comments on the interpretation of each.

Pulverized fuel from peat and brown coal. A. B. HELBIG. *Feuerungstechnik* **11**, 37-9 (1922).—Brown coal and dewatered peat can be successfully dried, powd., and burned, if ground sufficiently fine. It is better to carbonize the raw fuel at a low temp. and powder the coke, which is a better fuel, and more easily stored and powd.

Simplified determination of the calorific value of coal. FRITZ KÖNIG. *Chem.-Ztg.* **47**, 335-6 (1923).—The calorific value of a coal can be detd. from the following formula: $(rH_c/100) - (600 \times w/100)$, where r = % fixed C in the coal, w = H_2O content, and H_c = the heating value of the fixed C. This method requires that a proximate analysis be made of the coal, and avoids the use of costly app. such as a bomb calorimeter, or calcn. from an elementary analysis. The results deviate only slightly from those obtained by the usual bomb-calorimeter method.

Method and apparatus for the dehydration of different kinds of peat. R. W. STREHLÉNERT. *Svensk Kem. Tids.* **35**, 24-30 (1923).—Sven Odén in an article in *Tek. Tids.* 1920 on the colloidal nature of peat calls attention to the advantage of pressure in wet carbonization. Some of Odén's observations are confirmed and these new expts. "... indicate that a wet carbonization of highly huminified peat can take place at comparatively low temps. e.g., 120°, and yet give a well dehydrated product." Odén's classification will tell which peat can be handled advantageously in this manner. In the autoclave the CO_2 begins to evolve at 60°. When the vessel is held at any given temp. the evolution of CO_2 ceases after a time but begins again when the temp. is increased. CO is also formed and some acid gases from $AcOH$, HCO_2H , and $H_2C_2O_4$. At high temps. combustible gases are formed, as in dry carbonization. The material was pumped into copper cylinders with 0.5-mm. perforations and 6.5 kg./cm.² pressure applied. In the successful runs the water that came off after the peat mass had made its own filter mat was perfectly clear. The temp. was kept at 120° for the most part. This was sometimes difficult, as the reactions are exothermic. The observations are presented in three graphs with the vol. of H_2O pressed out plotted against the time (5 to 25 min.). From these curves it appears that the results are as good or better at 120° as at 180° with some classes of peat.

Low-temperature distillation of lignites and peats. MARCEL LAFFARGUE. *Technique moderne* **15**, 321-7 (1923).—A review.

A. R. ROSE

A. PAPINEAU-COUTURE

Lignite carbonization. Continuation and review of small-scale experiments. J. H. H. NICOLLS AND HAROLD KOHL. Can. Dept. Mines, *Summary Rept.* 1921, No. 586, 205-25(1923).—The purposes of these small-scale expts. on the lower-grade Canadian coals were (a) to obtain information concerning the nature of the carbonized residues produced by their destructive distn.; (b) by means of this information to indicate whether the increase in heating value of any one of the coals would warrant its carbonization and, if so, at what temp. it should be carbonized. The results are shown in 8 tables and 18 charts of curves. **Preliminary report of the Joint Peat Committee.** B. F. HAANEL. *Ibid* 319-38.—The machinery, processes and costs are fully described. Seven excellent full-page photographs are shown. L. W. RIGGS

The origin of fires in stored coal. H. MEYER. *Feuerungstechnik* 11, 25-7(1922).—A review. ERNEST W. THIBLE

Clean producer gas. R. M. CHATTERTON. *Fuels & Furnaces* 1, 110-3(1923).—The advantages of clean producer gas are compared to those of raw producer gas, city gas, natural gas, water gas, fuel oil and electricity. D. F. BROWN

Gas making from mixed coals. W. C. BUTTERWORTH. *Am. Gas J.* 118, 495-7(1923).—Mixts. of low-grade coal from Ill. with a good quality gas coal were used. Operation figures show an increase in coke production per ton of coal and a gas cost in favor of the mixed coals. J. L. WILEY

Grid condenser design. O. C. CLISHAM. *Am. Gas J.* 118, 517-20(1923). J. L. WILEY

World sources of mineral fuels. E. G. SIEVERS. *Gas Age-Record* 51, 757-61(1923).—Statistics on resources and consumption of coal, oil and gas. J. L. WILEY

Removing dust from water-gas blast gas. A. M. BEEBE. *Am. Gas J.* 118, 523-5(1923).—The 3 general methods are described: centrifugal pptn., washing, and elec. pptn. The former is the one most generally used, being the cheapest both in first cost and operation; its efficiency is, however, not so high as that of the other types. The washer type has not yet been applied to the water-gas blast gas problem but has been used successfully with producer gas. The efficiency of the elec. pptn. method is adjustable and is independent of the dust content of the gases. The precipitators may be operated only up to 500° F., so it would be necessary with the cleaning of water-gas blast gas to install a water spray before the precipitator. Calcns. are made for a plant capable of cleaning 60,000 cu. ft. of gas of 500° F. per min. J. L. WILEY

Suggested application of results of research to the practice of benzene recovery. T. BIDDULPH-SMITH. *Gas World* 78, No. 2028(Coking Sec.), 13-4(1923); *Chem. Age* (London) 8, 593-4.—The raising of the av. mol. wt. of wash oils is not due to disassoc. of the oil mols. with pptn. of C but rather to distn. out of the lighter products. Spent oil contains varying amts. of salts, Na, Fe and NH_4 chlorides and sulfates, which form emulsions with the water and the oil and thus lower the absorbing power of the oil. Two possible methods of eliminating suspended matter and H_2O are suggested: filtering the oil in circulation; and drying the air and gas between the cooling and scrubbing units. By making 100% crude benzene at 200°, the wash oil would maintain for a longer period its mol. wt. and also, providing the suspended matter is removed, its absorbing efficiency. J. L. WILEY

Extraction of naphthalene from coal gas. E. T. ROWE. *Chem. Eng. Mining Rev.* 15, 126-8(1922).—The Bayer charcoal extn. process was applied at the outlet of the purifiers to a gas contg. 13.22 grains of C_{10}H_8 per 100 cu. ft. The charcoal was passed through a 30-mesh sieve and used in a moist condition; its sp. gr. was 0.5 and the ash content 2%. A single purifier contg. 100 g. charcoal completely extd. the C_{10}H_8 until 142 cu. ft. had been passed at the rate of 1 cu. ft. per hr.; a second similar purifier placed in series with and after the first removed all of the C_{10}H_8 from a further 268 cu. ft.; a third placed after the second with the first cut out cleaned a further 250 cu. ft. These expts. show that approx. 1 ton of charcoal would be required per day for removal of C_{10}H_8 from 100,000 cu. ft. of gas per hr. The effect of this treatment on the calorific value, the c. p. and the compn. of the gas was practically nil. It would hardly be economical to revivify the spent charcoal; tests showed that the absorbing effect of revived charcoal on C_{10}H_8 was only about 0.1 that of fresh charcoal. Costs of the process will depend wholly upon local conditions. J. L. WILEY

Debenzoling of gas. A. MAILHE. *J. usines gaz* 47, 161-9(1923).—An extended account of the process including: (1) solid absorbents; (2) liquid absorbents; (a) choice of wash oil, (b) types of washing app., (c) debenzoling operation, (d) distn., (e) rectification. J. L. WILEY

Chemical products from natural gas. R. T. ELWORTHY. Can. Dept. Mines, *Summary Rept.* 1921, No. 586, 56-63; cf. C. A. 17, 2042.—The object of this paper is

to point out some of the ways in which natural gas can be utilized as raw material for a number of products and as a source of heat and electricity in the prepn. of those products. In 11 samples of typical Canadian natural gases, 9 carried 80% or over of CH_4 , and the 2 which contained 68.3 and 72.0%, resp., of CH_4 carried 15.9 and 16.7%, resp., of C_2H_6 and an unusual amt. of N. The products of natural gas in the order of their importance are gasoline, carbon black, helium, halogen derivs., hydrocarbons and oxidation products such as MeOH . The methods of obtaining these products from the gas are outlined. Not all of the products named are yet produced on a com. scale. **Possibility of producing methanol and formaldehyde from natural gas.** *Ibid* 64-72.—Natural gas from Ont. averages about 80% CH_4 , 12 C_2H_6 and 8 N_2 ; that from Alta. carries above 90% CH_4 . The following named methods for producing MeOH or HCHO from natural gas were tried: (1) Oxidation in the gaseous phase by passing mixts. of gas and O or air over various catalysts. (2) Oxidation by ozone. (3) Iodation and subsequent hydrolysis. (4) The reaction between CO_2 and CH_4 . (5) Formation of C_2H_4 from CH_4 and its subsequent oxidation. (6) Oxidation of CH_4 in soln. and by liquid oxidizing agents. Of these methods that by ozone appears most promising. Only preliminary expts. are reported on method (6). The remaining methods gave yields too small for profit.

L. W. RIGGS

Excess air in gas-fired apparatus. J. M. DAVIES AND T. T. GILL. *Gas Age-Record* 51, 727-8 (1923).—A method is developed whereby the CO_2 content of the flue gases can be used directly in detg. the excess air in any gas-fired app. A curve showing % of excess air as a function of CO_2 or O as obtained from Orsat analysis can be plotted from the analysis of the gas from any plant, and may be used for any app. using that fuel so long as the compn. does not change materially.

J. L. WILEY

Composition of high- and low-temperature tars. II. J. MARCUSSON AND M. PICARD. *Z. angew. Chem.* 36, 253-4 (1923).—The neutral oils from Upper Silesian (A) and Westphalian (B) low-temp. coal tars, after sepn. of a hard wax by treatment with fuller's earth and benzene, were examd. and compared with similar oily portions from coal tar and lignite producer tar. They differ from the neutral oil of the usual low-temp. tars in being nearly completely sulfonated, and from that of normal coal tar in having 41% insol. in Me_2SO_4 , whereas the normal tar oil is completely sol. in Me_2SO_4 . The portion insol. in Me_2SO_4 had the appearance of mineral machine oil, but gave a high I value (A, 47.6 and B, 43.2) and a high n (A, 1.525 and B, 1.535). The A and B neutral oils have formolite nos. of 96.8 and 101.2, resp., indicating 77.4 and 81% cyclic unsatd. hydrocarbons and cyclic S compds., approx. 25-30% of the latter. Acetyl nos. of 41.9 (A) and 57.2 (B) indicate high percentages of alcohols. Ketones were present in small amts. 19-22.6%, did not react with HCHO and H_2SO_4 and were considered to be composed of satd. hydrocarbons, naphthenes, polynaphthenes, paraffins and olefins. The properties of the oily portion of the neutral oils, including the I nos. (A, 61.4 and B, 58.2), the S content (6.3 and 5.4%), the reactions toward Me_2SO_4 and HCHO and H_2SO_4 , and the acetyl no., closely resemble these properties of similar oily portions from lignite producer tar, the latter, however, having 60% insol. in Me_2SO_4 and a higher ketone content as measured by the difference in the acetyl nos. before and after hydrogenation. Similar high-temp. coal-tar oils react more completely with HCHO and H_2SO_4 are practically free from satd. hydrocarbons and contain fewer alics. C. B. EDWARDS

Working up lignite producer tar. EUGEN SCHNELL. *Z. angew. Chem.* 36, 254-5 (1923).—A criticism of Frank (cf. C. A. 17, 2043), especially as to the tar used, which S. considers not an av. lignite producer tar, being more easily handled than most. The nature of the tar is dependent upon the producer system and the fuel. Because of the coal famine, various fuels have been used, causing the production of various quality tars from the same producer. Most problems in connection with large-scale distn. of these tars are considered solved.

C. B. EDWARDS

Light oil in coke-oven gas. A. L. DAVIS. *Ind. Eng. Chem.* 15, 689 (1923).—Light oil in the gas is detd. accurately by passing the metered gas through 300 cc. of C of 40-50 activity with subsequent distn. of the oil from the C suspended in pure cresol. After the distillate is washed with NaOH soln. the vol. is read.

H. L. OLIN

The simultaneous combustion of hydrogen and carbon monoxide. R. T. HASLAM. *Ind. Eng. Chem.* 15, 679-81 (1923).—At temps. between 900° and 1500° the reactions in the simultaneous combustion of H_2 and CO are trimolecular: $2\text{CO} + \text{O}_2 = 2\text{CO}_2$ and $2\text{H}_2 + \text{O}_2 = 2\text{H}_2\text{O}$. The ratio of velocity consts., $k_{\text{H}_2}/k_{\text{CO}} = 2.86$. The mechanism of combination of either H_2 or CO alone, with or without catalysis, seems to be different from that of a mixt. such as the ordinary fuel gas. Lower stack losses or greater production may be obtained from overburdened furnaces by the use of a gas high in H_2 because of its high reaction rate.

H. L. OLIN

Grudekoks. O. P. HOOD. *Coal Age* 23, 175-6(1923).—The author's name was incorrectly given "O. P. Hill" in C. A. 17, 1319. E. J. C.

Fuel economy in the sugar factory (SOMMIER) 28. Blowouts in Belgian coal seams (CORNET) 8.

COOPER, G. S.: **By-Product Coking.** London: Benn Bros., Ltd. 192 pp. 12s. 6d.

Absorption of low-boiling oils from natural or coal gas. KIKUNAE IKEDA, HAJIME ISOBE and TSURUJI OKAZAWA. Japan. 41,436, Jan. 24, 1922. When coal or natural gas is introduced into layers of fuller's earth, C_6H_6 , pentane, hexane and other volatile components are absorbed. The absorbed compds. are sep'd. from the fuller's earth by distn. The fuller's earth is made into a paste with 80-110% H_2O , formed into small rods or grains with irregular surfaces and the product is heated at 150-600° and piled in a suitable tower.

Fuel briquets. H. G. LLOYD. U. S. 1,458,716, June 12. See Brit. 170,092 (C. A. 16, 1145).

Peat drying. JAS. LUMSDEN. Can. 231,206, May 22, 1923. The surplus heated air and smoke from a furnace are conducted through the peat in a drier and the temp. is regulated in passage. Pat. 231,205 discloses app.

22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

The properties of petroleum. ANON. *Petroleum Times* 9, 848(1923).—A description is given of Silliman's early expts. on petroleum. D. F. BROWN

Treatment of natural-gas gasoline to meet the doctor test. D. B. DOW. Bur. Mines, *Repts. Investigations* No. 2462, 13 pp.(1923).—See C. A. 17, 2360. W. F. F.

Better temperature control in skimming crude increases gasoline yield. M. M. WATKINS. *Nat. Petroleum News* 15, No. 24, 41-5(1923).—Insertion of thermocouples in the vapor exit from the towers allows accurate control of the distillate obtained. D. F. BROWN

Use of bleaching powder for sweetening gasoline. H. W. YOUNG AND A. W. PRAKE. *Chem. Met. Eng.* 27, 972-6(1922).—A continuous treating plant for sweetening a 1:1 blend of naphtha and natural gasoline (Wyoming), both of which are "sour," is described. The train of towers (6.5 ft. \times 20 ft., dished heads, built for 50 lbs. per sq. in. operating pressure) consists of a weathering tower, treating tower, washing tower, and settling tower. The blend flows from the accumulators of the compression-plant to the weathering tower, where the vapor pressure is reduced to 42 lbs. per sq. in. This pressure is sufficient to force the blend through the system into storage tanks. A 500-gal. tank with open top is used for aerating the soln. of bleaching powder which is pumped continuously from the bottom of the treating tower. The aerated soln. is pumped from the aerating tower and mixed with the blend in a knot-hole mixer, the blend flowing into the 4-in. line, contg. the mixer. The mixer is made up of a pair of 0.125 in. plates with notched central openings, each being bolted between a pair of companion flanges. About 5 ft. of bleaching powder soln. is maintained in the treating tower. The mixt. of blend and soln. from the mixer enters the treating tower about 18 in. from the bottom, and rises through the soln. From the top of the treating tower, the sweetened blend flows to the bottom of the washing tower. The latter contains about 9 ft. of glazed tile baffling material, submerged in water. The wash water is drained off, and replaced with fresh water introduced through 2 lines about 5 ft. from the top of the tower. From the top of the washing tower, the blend flows into the lower part of the settling tower. The outlet from the settling tower is about 8 ft. from the bottom. Water or emulsion is drained from this tower when necessary. All of the towers are equipped with gage-glasses and safety-valves. Fresh soln. of bleaching powder is made up and delivered into the aerating tower when required. About 2000 gal. of soln., contg. 50-75 lbs. of bleaching powder, is kept in the system. The consumption of bleaching powder is 2.75 lbs. per 1000 gal. of blend. The capacity of the plant is estd. to be 4,000 bbls. per day. Indirect evidence, that the S compds. that are removed are mercaptans, is presented. W. F. FARAGHER

New cracking process expected to get more gasoline from heavy crude. ANON. *Nat. Petroleum News* 15, No. 25, 37-49(1923).—The chief features of the Black cracking process are that it is designed to operate at about 70 atms. pressure and that provision is made for cleaning C from the system with steam and hot water without drawing the fires and cooling the equipment. Oil is pumped through a coil in a pipe furnace and then to a horizontal chamber where its velocity is reduced and the C pptd. Further cracking may also take place in this chamber. From here the vapors pass through a heat exchanger to a fractionating tower or, if the latter be by-passed, they pass directly to the condenser and distillate tanks. Condensate from the heat exchanger is trapped out before reaching the tower. The process is covered by U. S. pat. 1,456,419 (C. A. 17, 2498) the 25 claims of which are printed in full.

D. F. BROWN

High recovery claim of Cross process. R. CROSS. *Refr. & Nat. Gasoline Mfr.* 2, No. 3, 12-6(1923).—The chief advantages of the Cross process are low fuel cost (about 1%), high yields (200 bbl. of "New Navy" gasoline per day from 350 bbl. of gas oil), low labor costs, safety to employees, flexibility of process. A brief description of the process is given. Oil is pumped through preheating coils to a pipe furnace whence it enters a horizontal reacting chamber at 850° F. and under 600 lbs. pressure. From here it passes to the vaporizer from which the vapors pass through a purifier for removing suspended matter and thence to a scrubbing tower and finally to the condenser.

D. F. BROWN

Burke-Hintze process described in detail. C. R. BURKE. *Refr. & Nat. Gasoline Mfr.* 2, No. 5, 8-10(1923).—This process for making oil gas and gasoline consists of 3 units. Crude oil is topped in the first unit by forcing it through a pipe still consisting of a series of parallel pipes upwardly inclined and connected by 2 common headers, one at each end. The oil enters the lower header, and from the upper header it passes to a vertical separating tower where the light gasoline vapors pass off from the top and the heavier condensate is drawn off at the bottom through a heat exchanger and then into the second unit which is similar to the first except that the oil now enters the upper header in the pipe furnace. Superheated steam may or may not be injected with the oil in the second unit, but it is always injected in the third unit which differs from the first two in that the tubes are bent in a < shape, the oil again entering at the top header, and there is no separating tower, the gases passing directly to the condenser. Cost and yield figures are given.

D. F. BROWN

Process for cracking heaviest oils useful when conditions change. ANON. *Nat. Petroleum News* 15, No. 23, 113-4; *Petroleum World* 20, 255-7(1923).—The Bowie-Cavin cracking process as applied to the low-grade oils obtained from the Casualia field consists of 4 stills (600 bbl. capacity) and a 250 bbl. "mixer," together with preheating and condensing equipment. The oil is preheated in a tubular retort to about 480° F. and then passes into a "breaker" where about 12% passes overhead as 31° Bé. distillate. The residuum from the breaker is free of water and is pumped to the first still at about 450° F. The temps. and gravities of the 4 stills which are operated continuously are:

No.	Temp. ° F.	Bé. gravity of overhead.
1	625	27.5
2	650	26.3
3	680	23.4
4	690	22.6

Uncondensed gases are used for fuel. The condensate is run to storage tanks. The residuum from No. 4 still is asphalt of about 70 penetration. This is pumped to the "mixer" and mixed with distillate from the storage tanks, giving a fluxed fuel oil of about 11° Bé. gravity. About 1.5% of the total mixt. is obtained overhead from the mixer as 60° Bé. distillate. The crude oil as it comes from the wells is about 9.5° Bé. and contains about 72% of water. It is pumped into a series of settling tanks from which some water is drawn off continuously. It is then mixed with 30° distillate in the ratio of 5 parts crude to 1 part distillate at about 180° F., thus bringing up the gravity of the crude to about 12.8° Bé. and making it mobile enough to permit of treatment in the Cottrell dehydrators. The mixt. is then pumped through further settling tanks maintained at about 180° F. and then through the dehydrators where it is subjected to an elec. discharge of 11,000 v. The treated oil is again settled and drawn off to be distd. as described above.

D. F. BROWN

The sludge formation in transformer oils. HANS STAGER. *Helvetica Chim. Acta* 6, 386-96(1923).—The decompn. of mineral oils used in steam turbines and transformers takes place owing to autoxidation combined with polymerization and condensation re-

actions. Asphalt combinations and asphaltogen acids are formed, also oil-sol. acids and cyclic unsatd. combinations which are sol. in the oil. By acetone extn. considerable amts. of unsatd. cyclic compds. may be removed. This class of compds. tends strongly toward acid formation.

Desulfurizing mineral oils. ANON. *Petroleum Times* 9, 867(1923).—The Collinson process consists in treating the distillate with Cl, HCl, gas, or a mixt. of dry HCl and H₂, settling the oil thus treated and treating the supernatant layer with H₂SO₄, NaOH and distg. The distillate is then treated with O₃ or other oxidizing agent, settled, treated with H₂SO₄ and heated to about 200–220° F. in the case of spirit and 750° F. in the case of oil.

The use of sulfuric acid in oil treatment. ANON. *Refr. & Nat. Gasoline Mfr.* 2, No. 2, 20–1(1923).—A general description and discussion of present practice in the acid treatment of oils are given. Strength and amt. of acid required, time of treatment, etc., are discussed.

The valuation, handling, and characteristics of fuel oil. FRANZ STANEK. *Feuerungstechnik* 11, 61–5(1922).—An elementary account of various liquid fuels, including a tabulation of their av. properties.

Preliminary report on the investigation of oil shales. A. A. SWINNERTON. Can. Dept. Mines, *Summary Rept.* 1921, No. 586, 239–49(1923).—A total of 101 samples of oil shale from all parts of Canada were subjected to distn. in an elec. heated furnace specially constructed to insure uniform heating of all parts of the charge, and to insure control of the various factors involved. The results are shown in 12 tables. Most of the oil came over at about 400° (cf. McKee and Lyder, *C. A.* 15, 3904–5). The yield of oil per ton ranged from 4 to 32 Imp. gal., gas 400 to 1500 cu. ft. and (NH₄)₂SO₄ 1 to 40 lbs. **Burning quality of kerosene oils for illuminating purposes.** P. V. ROSEWARNE. *Ibid* 226–32.—The object of this study was to obtain first-hand information concerning the relations between the chem. constituents, the phys. characteristics and the burning qualities of the oils. Samples of kerosene from 3 different refineries were tested by actual burning in an ordinary lamp and the oil showing the most satisfactory result had the lowest iodine value, sp. gr., and S content. This agrees with the statement of Bacon and Hamor (cf. *Am. Petroleum Ind.* p. 876) as regards I and S values but not with respect to sp. gr.

Cretaceous shales of Manitoba and Saskatchewan as a possible source of crude petroleum. S. C. ELLIS. Can. Dept. Mines, *Summary Rept.* 1921, No. 586, 34–41(1923).—The geological features and origins of these shales are described. Analyses of about 30 samples gave from 1 to 10.9 Imp. gal. of crude petroleum per ton. The S content of 6 samples of the oil averaged 6.5%. The gas yield from 13 representative samples ranged from 410 to 1130 cu. ft. per ton. Two samples of the gas gave approx. CH₄ 30%, CO₂ 28, H₂ 8.2, CO 2.1, net calorific value 350 B. t. u. per cu. ft. These shales are of little present economic importance as a possible source of petroleum or of (NH₄)₂SO₄. **Oil shales of Canada.** *Ibid* 41–55.—A summary and a review of the available information regarding the oil shales in the various Canadian provinces are given. The abundance of petroleum in other localities and the production of (NH₄)₂SO₄ from other sources than shale make the shale industry, at present, unprofitable. Yet the oil-shale deposits of Canada remain a potentially valuable national asset.

Concerning bituminous "cyprisschiefer" in Bohemia. ST. LANDA. *Petroleum Z.* 19, 501(1923).—Tests have been made on 49 samples of the shale. The av. moisture content is 25–30%. On heating a combustible gas and a black residue are formed. Samples dried at 140° gave 67–96% ash. Those from the region of Falkenau have the lowest ash content. Samples from the northern part, south west of Falkenau, and western part gave the following tests, resp.: ash 67.1, 74.4, 77.4; combustible matter 32.9, 25.6, 22.1; N 0.42, 0.28, 0.25; S —, —, 0.1%. From the 3rd sample the following results were obtained: heat of combustion 957 cal.; coking test, liquid constituents 20.8%, residue 79.2%. The residue gave on elementary analysis 1.7% C and 0.2% H. Distn.-oil yield 4, water 8, residue 86, gas and loss 2%. 100 g. of the shale gave 5.8 l. of gas of 2600 cal. heat value. The oil is a brown fluid and solidifies at 16°. D. F. B.

Lubricating value of cod-liver oil. P. V. ROSEWARNE. Can. Dept. Mines, *Summary Rept.* 1921, No. 586, 232–8(1923).—This study was undertaken in response to an inquiry of the Air Board of Canada, respecting "the possible use of cod-liver oil as a lubricant in aero engines and a comparison of the lubricating properties of cod-liver oil with, say, pharmaceutical castor oil." Accordingly 2 samples of castor oil and 1 of cod-liver oil were tested for viscosity (Redwood) at temps. from 37.8 to 148.9°, friction (Thurston oil tester) at 90°, corrosion on soft brass and on hardened steel, and gumming. The usual chem. and phys. constns. for oils were also detd. Cod-liver oil as a lubricant

would be suitable for light machines were it not for its excessive gumming properties. Castor oil is a more suitable lubricant than cod-liver oil for heavy machines, since it can support greater pressure, is more durable and it does not gum. Cod-liver oil has a low coeff. of friction and permits cool bearings, but requires a large supply of oil to the moving parts. Castor oil has a higher coeff. of friction, but does not require a large supply of oil. Compared with castor oil, cod-liver oil does not corrode brass or steel at high temps.; it has a lower flash point (but high enough); it solidifies at a higher temp.; solid matter seps. from it; and it mixes with gasoline. Cod-liver oil as sold at the present time is not a suitable lubricant for airplane engines.

L. W. RIGGS

Proposed method for solving some problems in lubrication. W. STONE. *Commonwealth Eng.* 9, 115-22, 139-49 (1921).—Expts. were performed to test the conditions of formation and the stability of the lubricating film in a Michell thrust bearing and to det. the effect of variations of viscosity in different parts of the film due to varying temps. The block was a smoothly polished piece of quartz crystal pressed against a rotating disk by means of a calibrated spring. The angle between the block and disk was detd. by the interference bands. The lubricant used was air. Curves are given to show the effects of changes in temp. and viscosity on the pressure at different parts of the bearing. The departure in the behavior of the blocks from that indicated by the theory is due to a change in the position of the center of pressure as the load is applied or the speed varied. Under apparently normal conditions the block will sometimes fail to scp. from the plane even though a small negative load is applied. Under some apparently normal conditions the conditions of the lubricating film become unstable. Two blocks apparently identical behave differently, showing the importance of relatively small differences in the working surfaces.

EUGENE C. BINGHAM

The calculation of the frictional resistance in a lubricated bearing from the viscosity of the lubricant and the capillary relations of lubricant and bearing metal for the purpose of estimating the value of a lubricant. R. W. v. DALLWITZ. *Z. techn. Physik* 3, 21-8 (1922).

EUGENE C. BINGHAM

The temperature coefficient of boundary lubrication. W. B. HARDY AND IDA DOUBLEDAY. *Proc. Roy. Soc. 101A*, 487-92 (1922); cf. *C. A.* 16, 2187.—Using a slider, having a spherical face sliding over a plate, as in the previous investigation, the authors studied both clean and contaminated surfaces. To obtain clean surfaces, a double chamber was used, of which the inner wall was of sheet nickel; thus contaminating vapors were avoided. Steel and bismuth showed no change in static friction between 15° and 110°. Quartz behaved similarly when specially cleaned with chromic acid with rubbing, but glass could not be used, because its static friction falls rapidly as the temp. is raised and it does not come back on cooling. With contaminated surfaces the friction falls steadily with rise in temp. until the melting point is reached, when the friction becomes zero. As lubricants nonadecane, docosane, tetracosane, decoic acid, undecic acid, palmitic acid, stearic acid, and cetyl alc. were used. When the lubricant is liquid, the friction reappears at a higher value and remains const. over the temp. range. As the thickness of the lubricating film is decreased the static friction appears instantly, showing that there is no gradual transition from solid to liquid friction but rather a sudden change at a certain critical thickness of film.

EUGENE C. BINGHAM

Boundary lubrication and chemical constitution. The optically active carbinols of the formula $C_2H_5CH(OH)C_nH_{2n+1}$. IDA DOUBLEDAY. *J. Chem. Soc.* 121, 2875-9 (1922); cf. preceding abstract.—Results are reported on 14 normal secondary alcohols. The coeff. of friction μ is found to be related to the mol. wt. M of the lubricant by the formula, $\mu = a - bM$, except in three cases.

EUGENE C. BINGHAM

Asphalt from petroleum residues. CH. IGNAT. *Ann. Mines Roumanie* 4, 31 (1921).—Reference is made to the industrial importance of the Manea process for converting suitable petroleum residues into asphalt. *Ibid* 5, 208 (1922).—Physical and chemical relationships in the transformation of petroleum residues into asphalt are briefly considered.

E. T. ERICKSON

The transformation of petroleum residues into asphalt. EDMOND SCHMITZ. *Mat. grasses* 14, 6213-4, 6234-5, 6291-3 (1922).—S. criticizes Ignat (preceding abstract) and describes an investigation which he carried out in 1908 which resulted in his perfecting a com. process for transforming petroleum tar into asphalt by heating with S or with air.

A. PAFINEAU-COUTURE

Specific character of the heavy oils of beech creosote. BORDAS AND TOULPLAIN. *Compt. rend.* 176, 1328-9 (1923).—An alc. soln. of the various fractions of the heavy oils of beech creosote gives a blue coloration by the addn. of a soln. of $Ba(OH)_2$ or $Ca(OH)_2$. This character has been observed by Pastrovich for that portion of the oil of beech tar which boils at 240° (cf. *Monatshfte* 4, (1883)). P. attributes this property to the pres-

ence of cerulignol, $C_9H_{10}(OH)OCH_3$. By a special technic, not described, 1 part of the heavy oil in 20,000 parts of alc. can be detected. The use of these heavy oils, with the addn. of boric ether, is recommended for denaturing alc. L. W. RIGGS

The carbonization of wood waste. E. SEYFFERT. *Chem.-Ztg.* **47**, 181-3 (1923).—An illustrated description of the plant and equipment for carbonizing sawdust, etc., with recovery of charcoal of 8000 cal., $Ca(OAc)_2$, wood spirit and tar, with data on costs. C. C. DAVIS

Cracking and distilling hydrocarbon oils. A. SCHWARZ. U. S. 1,458,443, June 12. In the production of gasoline, etc., from fuel oils or similar heavier oils, which may be mixed with kerosene, an oil blend contg. satd. and unsatd. hydrocarbons is violently agitated while heated with gaseous hydrocarbons or superheated steam to form a gas-oil emulsion and the latter is subjected to distn. to obtain a condensate of low b. p. The residue may be repeatedly retreated by the same process to obtain successive good yields of hydrocarbons of low b. p. A detailed discussion of app. used is given together with much general and theoretical discussion of petroleum cracking and distn.

Apparatus for extracting volatile products from oil shale or similar materials. C. POSTEL. U. S. 1,458,357, June 12. An inclined horizontal cylindrical rotatable retort through which the material such as shale is passed is provided with a jacket contg. molten metal heated by burners, evenly to heat all parts of the retort. Vapors distd. are passed to a condenser.

Apparatus for electrically dehydrating petroleum. F. W. HARRIS. U. S. 1,458,291, June 12.

23—CELLULOSE AND PAPER

CARLETON E. CURRAN

The correlation of solvent power and the viscosity of cellulose ester solutions. E. W. J. MARPLES. *J. Soc. Chem. Ind.* **42**, 207-11T (1923).—In general the best solvents for a cellulose ester yield the least viscous solns. By tables and curves the viscosity and relative solvent power for cellulose nitrate and acetate in alc.-ether, acetone-water, acetone-alc., acetone-benzene, alcohol-camphor, nitrobenzene-alc., benzyl alc.-acetone and cresol-acetone, are shown. The importance of this correlation from both a theoretical and practical point of view is evident. That the optimum solvent mixt. should possess the max. fluidity follows from the fact that with the highest degree of dispersion there is the nearest approach to a true (molecularly dispersed) soln. with its characteristically low viscosity. W. C. EBAUGH

The reducing power of cellulose of various origins. M. N. KOMAROFF. *Bumash-naia Promyshlennost* (Russia) **1**, Nos. 2-3, 224-36 (1922).—A review of the knowledge relating to cellulose, the hemicelluloses and the compd. celluloses. Müller's titrimetric method for the detn. of the reducing power of sugar has been found applicable to cellulose. This method gives the "corrected copper value" of cellulose. The corrected copper value and the hydrolysis no., resp., are (gathered from various sources) for purified cotton, 0.2 to 1.8%, 2.7 to 3.3%; unbleached sulfite, 0.5 to 2.0, 3.5 to 6.0; bleached sulfite, 1.5 to 3.96, 5.6 to 8.0; mercerized cotton, 1.9, 6.6; mercerized sulfite, 0.6 to 1.2, 6.6; viscose from cotton, 0.8 to 3.0, 14.0 to 16.6; viscose from sulfite, 0.2 to 1.93, 14.0 to 16.6; parchment from cotton, 1.9 to 7.1, 17.6; Guignet cellulose, 10.78, 7.26; Fleischig's amyloid, 18.36, 26.67; hydrocellulose, cotton and wood, 3.6 to 8.8, 6.6; oxycellulose, cotton and wood, 5.8 to 33.2, —; cotton dextrose, 18.02, —. The following copper values were obtained by K.: Purified cotton, 0.51%; unbleached sulfite, imported, 2.30; bleached sulfite, imported, 2.75; unbleached soda, 2.04; semibleached sulfite, domestic, 2.56; same, mercerized, 2.38; purified cotton (English), 1.44; same, mercerized, 1.05; sulfite cooked with selenium, cook No. 1, 3.28; cook No. 2, 2.94; cook No. 3, 3.55. M. L. CAUST

Purifying soda cellulose—A new process. F. KRENN. *Wochbl. Papierfabr.* **54**, 698-9 (1923); *Paper Ind.* **5**, 479-80 (1923).—The cooks are timed so that after one cook has been blown into the diffuser the next cook is ready to relieve, and in releasing the pressure from 9 to 4 atm. the released steam is led into the diffuser to force the black liquor out of the pulp. The latter is broken up by means of water under pressure which is forced through perforated pipes. A. PAPINEAU-COUTURE

Losses in making soda fiber. E. SUTERMEISTER. *Paper Mill* **47**, No. 22, 38; 60 (1923); *Paper Ind.* **5**, 488-9 (1923).—Brief discussion of the losses caused by poor-quality wood, and of heat, soda, lime, fiber and time losses. A. PAPINEAU-COUTURE

Sulfite waste liquors. I. I. CHRAMTSOV. *Bumashnaia Promyshlennost* 1, No. 1, 39-54(1922).—The processes and chem. reactions involved in chem. wood pulp production are discussed. Analyses of the woods and of the resulting products under different cooking conditions are given. The by-products and their utilization and the disposal of waste waters are taken up. Numerous data, original and quoted, are presented. *Ibid* Nos. 2-3, 237-77.—A detailed discussion of the effects of sulfite liquors on plant and animal life present in rivers. Experience at the Suchon mill has shown that sulfite liquors may render the river water unfit for boiler use. The difficulty of economical evapn. of the waste liquors is due to the high viscosity of the liquors at moderate concn.

M. L. CAUST

Control in Mitscherlich sulfite mill. V. P. EDWARDES. *Paper Mill* 47, No. 21, 16, 40(1923); *Paper Trade J.* 76, No. 22, 47-8(1923); *Paper Ind.* 5, 498-9(1923); *Paper* 32, No. 7, 10, 16(1923).—Outline of proper control of acid making, cooking, and grading of pulp.

A. PAPINEAU-COUTURE

Chlorine, chlorine hydrate and waste waters. RAYMOND FOURNIER. *Papeterie* 45, 374-8, 418-25(1923).—The DeVains process (C. A. 16, 1864, 4059) is being further studied with a view to decreasing the NaOH consumption without increasing Cl consumption and eliminating the discharge of alk. waste liquors. Decrease in NaOH consumption can be obtained by partial recovery, so that the amt. actually used is equiv. to the Cl used. By mixing waste bleach and alk. liquors, they neutralize each other and the mixt. is practically neutral. These waste liquors are discussed from the standpoint of stream pollution.

A. PAPINEAU-COUTURE

Sulfite mill control. O. L. BERGER. *Paper Mill* 47, No. 22, 54, 56(1923); *Paper Trade J.* 76, No. 23, 36, 38(1923); *Paper Ind.* 5, 493-4(1923).—Brief outline of the control of wood received, barking, chipping, acid making, cooking, reclaiming acid and bleaching.

A. PAPINEAU-COUTURE

Distribution of methoxyl in the products of cooking jack pine by the soda process. S. S. AYAR. *Ind. Eng. Chem.* 15, 714-6(1923); cf. C. A. 16, 4338.—Jack pine was cooked under the same conditions except for variation in time and the methoxyl content of the wood, pulp and liquor (fixed and volatile) was estd. (Zeisel). Volatile methoxyl in the liquor attains a max. after cooking approx., 1 hr. and diminishes thereafter, while the fixed methoxyl increases with the time of cooking. The lignin and methoxyl content of the pulp show a close relation, indicating that methoxyl is associated with lignin in only one way. The removal of lignin and methoxyl from the pulp practically ceases after 2 hrs'. heating at 110 lbs. per sq. in., showing that no advantage is gained by further heating.

FRANCIS G. RAWLING

Influence of sulfur in cooking jack pine by the sulfate method. S. D. WELLS. *Pulp Paper Mag. Can.* 21, 623-6(1923).—Expts. and results described in detail show that the general effect of S in the cooking of sulfate pulps is to speed up the cooking reaction. There are marked increases in tearing resistance (almost 20%), folding resistance (almost 500%), bursting strength and tensile strength. Where equal yields of pulp are obtained, the use of S reduces bleach consumption. Use of S reduces the loss of cellulose in the first $\frac{1}{2}$ hr. of cooking about 50%. There is otherwise little difference in the chem. compn. of the pulps.

A. PAPINEAU-COUTURE

Chemistry of the alkaline wood pulp process. I. Aspen, loblolly pine, and jack pine by the soda process. S. D. WELLS, R. H. GRABOW, J. A. STADL AND M. W. BRAY. *Paper Trade J.* 76, No. 24, 49-55(1923).—A large series of cooks is described in detail, with analyses of impregnating, cooking and black liquors, and analyses and strength tests of the pulps at various stages of the process. All cooks were made with preliminary impregnation. Approx. 90% of the cooking occurs during the first 2 hrs. At the beginning the cellulose is removed as fast as the lignin; but in the middle portion of the cook lignin removal is more rapid. The wood constituents forming AcOH, HCO₂H and other volatile acids are easily hydrolyzed, most of them being removed before the digester has reached full pressure. The point of max. bleachability may be passed in cooking, and further cooking increases bleach requirements. Extn. and removal of alkali-sol. material in one case greatly increased ease of bleaching. During the latter part of the cook volatile methoxyl compds. are converted into non-volatile compds.

A. PAPINEAU-COUTURE

Degree of hydration and degree of heating. CARL G. SCHWALBE. *Paper Trade J.* 76, No. 24, 47-8(1923).—See C. A. 17, 1328.

A. PAPINEAU-COUTURE

Use of white water in the manufacture of groundwood pulp and effect on freeness. W. E. BRAUN. *Paper Trade J.* 76, No. 23, 50-2(1923).—Use of white water reduces the freeness of ground-wood owing to the "flour" present in the white water. If the pulp is used directly from the groundwood mill in slush form, white water increases the

temp. and consequently raises the freeness to an extent which may fully counteract the effect of the "flour." If the pulp is used as laps, heat or other means must be used to restore the freeness on the paper machine. Variations in the size and character of fibers in the stock and white water give varying results and should be studied with the aid of the microscope.

A. PAPINEAU-COUTURE

Classification and definitions of paper. CLARENCE J. WEST. *Paper Trade J.* 76, No. 22, 49-54(1923).

A. PAPINEAU-COUTURE

Quality and properties of the chief grades of paper. E. ARNOULD. *Pulp Paper Mag. Can.* 21, 525-8(1923).—See *C. A.* 16, 4344.

A. PAPINEAU-COUTURE

Electricity masters paper making. R. H. ROGERS. *Gen. Elec. Rev.* 26, 250(1923).—Description of the first "all elec." paper mill, giving many facts and figures.

C. G. F.

Studies on mechanical paper technology. F. BOBROV. *Bumazhnaia Promyshlennost* (Russia) 1, Nos. 2-3, 193-212(1922); cf. *C. A.* 17, 2191.—The factors affecting grinding are combined into a mathematical equation depending upon the pressure n per sq. cm. of the grinding stone. By giving n definite values a curve can be drawn very similar to the one obtained by Kirchner empirically. (*Das Papier* IIIA, p. 57), proving that the mathematical formula is correct.

M. L. CAUSER

Ageing of rubber latex paper. M. B. SHAW AND F. T. CARSON. *Paper Trade J.* 76, No. 25, 47-9(1923).—Successive analyses of the same papers with increasing age indicated comparatively rapid oxidation of the rubber retained in the papers. With sulfite and soda papers complete oxidation took place in a few days, while with rag papers oxidation of the greater part of the rubber took several months.

A. P.-C.

The Decker cooking system. ANON. *Paper Trade J.* 76, No. 25, 49(1923).—The process consists in using a freshly charged digester as reclaiming tank for "relief" gas and "relief" liquor. The advantages are reduced steam consumption (about 4,400 lb. required per t. of pulp) and wood consumption (about 0.3 cord less per t. of pulp), total absence of uncooked chips, and uniformity in the quality of the pulp. It has been in com. use for nearly two years.

A. PAPINEAU-COUTURE

Problems of sulfite pulp manufacture. A. S. M. KLEIN. *Pulp Paper Mag. Can.* 21, 619-20(1923).—General discussion of some fundamental problems: cellulose chemistry, steaming before digestion, function of reclaimed acid, use of sulfite waste liquor.

A. PAPINEAU-COUTURE

Precision in beating (paper) stock. A. B. GREEN. *Paper Mill* 47, No. 21, 14, 42, 44(1923).—A discussion of the use of the Green beater drag (U. S. pat. 1,321,736, *C. A.* 14, 223), showing that it must be designed and used to meet the conditions in each individual mill.

A. PAPINEAU-COUTURE

Coloring paper. K. T. KING. *Paper Mill* 47, No. 22, 46, 52(1923); *Paper Ind.* 5, 489-90(1923).—Brief discussion of prevention of mottled fibers, differences in color absorption in kraft and sulfite pulps due to variation in cooking methods, foaming, 2-sided effect, and water conditions.

A. PAPINEAU-COUTURE

Theoretical discussion of the reactions of paper making. JESSIE E. MINOR. *Paper Trade J.* 76, No. 23, 55-9(1923).—A brief review of Loch's "Donnan membrane equilibrium theory," with a discussion of its application to cellulose and the colloidal conditions in paper making.

A. PAPINEAU-COUTURE

Surface-colored papers. ANON. *Paper Making* 62, 174-5(1923).—A brief description of the prepn. of red alizarin lake and of indigo blue paste and of the method of using them in the manuf. of surface-colored papers.

A. PAPINEAU-COUTURE

Testing blotting papers. G. DALEN. *Paper* 32, No. 7, 5-8, 28(1923).—Height of absorption, which is the usual criterion for judging blotting paper, generally gives good indications as to its quality, but it sometimes gives entirely faulty indications due to the insufficient capacity of the surface to become wet. D. devised the following test, which closely approximates conditions under which the paper is used. Ink is allowed to drop from a buret on to a sheet of a good grade of writing paper; this is immediately passed, along with a strip of the blotter to be tested, between a pair of rolls. The blotter is supported so as not to come in contact with the ink until it reaches the nip of the rolls. The size of the stain (which should be measured on the writing, not on the blotting paper) is affected by the speed and pressure of the rolls and the angle between the papers. Measurement is made from the lower edge of the drop of ink to the point of the blot. Provided it is free from sediment and is not too thick, the character of the ink has no appreciable effect on results. Hygrometric conditions have but slight effect. Traces of fat in the paper affect the height of absorption but little, but very greatly increase the length of the blots. Paper possessing a high degree of "wetting capacity" is but little affected by treatment with various reagents; but when

it is not easily wetted there is a considerable decrease in the length of the blots, even when treated with distd. water.

Testing the strength of pulps. R. W. SINDALL and W. N. BACON. *World's Paper Trade Rev.* 79, 1268-78, 1292-8(1923); *Paper Makers' Monthly J.* 61, 155-60(1923); *Paper Maker and Brit. Paper Trade J.* 65, 586-91(1923); *Paper Making* 42, 160-5 (1923); *Paper* 32, No. 5, 7-10, 21(May 23, 1923).—A discussion (with description and results of tests) of the factors influencing results in strength testing of pulps, which indicates that it is necessary to hydrate the pulp and submit it to some beating process in order to bring out fully its paper-making qualities.

The Elmendorf tearing test and its relation to the bursting-strength test. R. SUTERMISTER. *Paper Ind.* 5, 477-9(1923).—Comparative tests on 77 samples showed that there is no const. relation between the bursting and tearing strengths. Tests on samples of pulp beaten 0.5, 1, 1.5, and 2 hrs. showed that the bursting strength increases as the time of beating is lengthened; while the Elmendorf tearing test is practically a const. and is independent of the time of beating, showing that there is still a certain quality in connection with the tearing of paper which is not taken into account by the Elmendorf tester.

SIEBER, RUDOLF, and DIERDORF, H.: *Carl Hoffmanns Praktisches Handbuch der Papierfabrikation*. Vol. 3. Leimen, Füllen u. Farben des Papierstoffes. 3rd. revised ed. Berlin: Verlag Carl Hoffmann. M. 15.

Cellulose ether composition. A. P. H. TRIVELLI. U. S. 1,458,256, June 12. A compn. adapted for use as a *varnish* on motion-picture films is formed of cellulose ethyl ether together with Bu or Am alc. and C_6H_6 , toluene or xylene.

Acetylcellulose films. W. J. STEVENSON. U. S. 1,458,505, June 12. Non-inflammable films are formed of acetyl cellulose with 5-15% each of triacetin and triphenyl phosphate.

Wrapping tissue of acetylcellulose. C. P. OLSON. U. S. 1,458,592, June 12. Sheets similar to tissue paper are formed of acetylcellulose.

Evaporating sulfite cellulose. E. WIRTH-FREY. Can. 231,625, June 5, 1923. Sulfite lyes are maintained alk. during the entire period of evapn. $CaSO_4$ is removed by the introduction of CO_2 .

Bisulfite liquor for cooking pulp. G. A. RICHTER. U. S. 1,458,309, June 12. Raw acid liquor is enriched with SO_2 from recovered blow-pit gas to produce an intermediate acid liquor and a final acid liquor is prepd. from this intermediate liquor by enriching it with SO_2 obtained as relief gas from the digester. U. S. 1,458,310 specifies producing a sulfite cooking liquor by an absorption system, sepg. the gases from the hot liquor relieved from the digester, cooling the sepd. strong gas thus obtained and absorbing SO_2 from it. Free SO_2 is recovered from the remaining hot relief liquor and is passed into the system where the strength of the gas in the system is about the same as that of the recovered gas.

Papermaker's felt. F. N. HUYCK. U. S. 1,458,342, June 12. Endless papermaker's felts are marked with a guide line after fulling or felting; a dye such as indigo, logwood or coal, tar dyes which will have practically no other effect on the felt except to color it are used.

Paper material from bamboo. KAZUMA OKOCHI. Japan. 41,458, Jan. 24, 1922. In boiling bamboo with alkali, alc. ext. of oak is added to prevent decompn. of the fiber itself and to decrease the loss of fiber. Bamboo pieces (3.75 kg.) are boiled with 225 g. of NaOH, 2.16 l. of H_2O and 0.27 l. of the alc. ext., washed with H_2O and bleached. The alc. ext. is prepd. by treating 450 g. of sliced oak with 80 g. of 85-90% alc. at 50°.

Safety paper. TAMEZO UEDA and THE KARUSHIKI KAISHA SHOEIDO INSATSUJO. Japan. 41,380, Jan. 11, 1922. A design is printed with a fish-glue soln. of a dyestuff, such as Victoria blue, which can be bleached by acid or bleaching soln., and the paper is exposed to vapor of HCHO to waterproof the design. When letters written with ink are erased with ink-eraser, the design also is erased.

Apparatus for waterproofing paper or cloth. KUNIHICO SATO. Japan. 41,399, Jan. 19, 1922. The material is put in a double-walled cylindrical vessel, a soln. of waterproofing reagent is thrown in and shaken until the reagent penetrates the material, excess of the reagent is drawn away and the remaining solvent is recovered by distn.

Waterproofing paper collars and cuffs. KEIYU SERIYA. Japan. 41,392, Jan. 12, 1922. Paper collars or cuffs are painted with a soln. of starch, $Pb(OAc)_2$, gum arabic, and ZnO , and then treated with a soln. of soap and Na borate or silicate.

24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

Explosives; their materials, constitution and analysis. C. A. TAYLOR and WM. H. RINKENBACH. Bureau of Mines, *Bull.* 219, 188 pp. (1923).—The formulas, characteristics and methods of analysis and tests are given for a large number of explosive compounds, materials used in making explosive mixts., and of such mixts., together with methods of analyzing the charges of detonators and primers. The precautions to be taken to avoid explosions and poisoning are especially dwelt upon. C. E. MUNROE

Preparation and properties of nitro compounds of benzene and toluene. II. M. KOSTEVICH. *Pamphlet* 20 pp., 4 plates, Paris, 1923.—This contains samples of nitrations with practical data of TNT by normal method, 2 methods for 2,4-DNT from 4-MNT; TNT from 2,4-DNT; and direct nitrations of DNT and TNT from C_7H_8 and TNT from *o*-MNT. The plates show the curves for three nitrations and a summary of different Δ 's by treble coordinates. CHARLES E. MUNROE

Progress of investigations on liquid-oxygen explosives. S. P. HOWELL, J. W. PAUL and J. L. SHEPHERD. Bur. of Mines, *Tech. Paper* No. 294, 91 pp. (1923).—From the results obtained in tests of the absorptive and evaporative capacity of various absorbent and combustible materials it was found possible to design explosive mixts. that would retain enough liquid O after 15 min. to provide for the exact combustion of their components to CO_2 and H_2O , thereby allowing a loading period of at least 15 mins. A high percentage of O in the liquid air is necessary for good results; 98% liquid O is recommended. At least 20% of crude oil, paraffin or liquid hydrocarbon is necessary for detonation when unconfined. Diatomaceous earth is very efficient as an absorbent when these hydrocarbons are used. Wood pulp as an ingredient renders LOXs less sensitive to detonation. Thermochem. calcs. offer some hope of so modifying LOXs as to make them suitable for use in coal mines by addition of salts contg. H_2O of crystn., such as $Na_2CO_3 \cdot 10H_2O$, and firing the explosives with a deficiency of O. Although evapn. tests show the life of LOX cartridges increases with diam., $1\frac{1}{4}$ " cartridges have been successfully used in certain of these investigations, but the larger the diam. of the cartridge the more latitude there is as regards time of firing. The ballistic pendulum was found suitable for tests of LOX explosives and by this all of the LOX explosives tested compared favorably with 40% straight nitroglycerin dynamite as regards strength. CHARLES E. MUNROE

The so-called pre-pressure interval in gaseous explosions. J. D. MORGAN. *J. Chem. Soc.* 123, 1304-8 (1923).—When an explosive gaseous mixt., contained in a closed vessel, is ignited by an elec. spark, and records are made of the passage of the spark and of the rise of the explosion pressure, it is found that the commencement of rise of pressure occurs, not simultaneously with the passage of the igniting spark, but later, the two events being sepd. by a relatively large interval of time. This interval is usually referred to as the no-pressure or pre-pressure interval. M. finds that 87.5% of the pre-pressure interval in the pressure-time diagram is due to lack of sensitiveness in the indicator and that the true origin of the pressure curve is sepd. from the instant of passage of the igniting spark by an interval not greater than that required for a pressure pulse to travel from the region of the spark to the indicator. CHARLES E. MUNROE

Modern improvements in small-arms powders. L. C. WELDMAN. *Army Ordinance* 3, 342-5 (1923).—It has been sought to control the rate of burning not only by means of the N content, the form and size of grain and perforating the grain with one or more canals, but also by coating it first with camphor, then with dimethyldiphenyl urea (*centralite*) and finally dinitrotoluene (*trivylene*). A later method now practiced is to incorporate a sol. salt in the mass and dissolve this out of the grains. Double-base powders are now made with nonvolatile solvents. Considerable space is devoted to a description of blending. CHARLES E. MUNROE

Powder development at Picatinny Arsenal. ANON. *Army Ordinance* 3, 320 (1923).—A 4-in. trench mortar powder is prepd. in thin perforated disks; it requires no container. A 75-mm. powder is formed into thin strips. To obtain the desired ballistic properties and avoid the use of solvent a small amt. of $C_2H_5(NO_2)_2$ is used. The ingredients are incorporated in a heated mixer, rolled into sheets and formed into grains. The powder can be fired within 48 hrs. from time of mixing, but more uniform ballistics is obtained by allowing it to age 2-3 days. It is non-hygroscopic. The ballistics is not affected by 24 hrs. submergence in water even if it is fired immediately on removal. C. E. M.

25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

Dyestuff standards issued by Customs Division. ANON. *Color Trade J.* 12, 243-4(1923).—A list of the dyestuffs accepted as tentative standards by the Customs Division of the Treasury Dept. CHAS. E. MULLIN

The behavior of titanic acid towards dyestuffs. A. M. MORLEY AND J. K. WOOD. *J. Soc. Dyers Colourists* 39, 100-5(1923).—Expts. support the theory of Collins and Wood (*C. A.* 16, 1712) that the differences between the α - or o -titanic acid and the β - or m -variety arise from a difference in the size and complexity of their ultimate particles, due to the amphoteric nature of the compd. A continuous series of products of increasing β -character results from repeated condensation between mols. acting in the capacity of acid and base. The α - and β -varieties were prepd. by pptg. a 2% titanic chloride soln. with NH_4OH , both with and without an excess of NH_4OH , and with CaCO_3 . The α - and β -acid pptd. by an excess of NH_4OH readily adsorbed basic but not acid dyestuffs, while the acid pptd. without an excess of NH_4OH adsorbed acid but not basic dyestuffs. The acid prepd. by pptg. with CaCO_3 had a small adsorptive power for both acid and basic dyes. This selective adsorption is accounted for by the electric charge of the pptd. particles. The adsorption of the α -acid for a given dyestuff is greater than the β -variety and in general the adsorption of both varieties diminishes with dehydration. The quantities of dyestuffs adsorbed by any sample of titanic acid does not appear to bear any relation to the mol. proportions of the dyestuffs. CHAS. E. MULLIN

The behavior of stannic acid towards dyestuffs. A. M. MORLEY AND J. K. WOOD. *J. Soc. Dyers Colourists* 39, 105-7(1923); cf. *C. A.* 16, 1712, 3274; 17, 1196 and preceding abstr.—Expt. shows that as in the case of titanic acid, stannic acid pptd. with an excess of NH_4OH readily adsorbs basic dyestuffs while that pptd. with insufficient NH_4OH adsorbs acid dyestuffs only. CHAS. E. MULLIN

The dyeing of ivory. W. R. McKENNON. *Textile Colorist* 44, 797-9(1922); 45, 26-7(1923).—The ivory is washed with hot alk. solns. and is best bleached with peroxides but Cl and SO_2 solns. are used. To aid dye penetration it is then "etched" by immersion in dil. HNO_3 for 5-20 min. and rinsed. It is dyed in hot or cold baths and rinsed until no more color is removed. Formulas are given for dyeing with carmine, picric acid and magenta, AgNO_3 , logwood, bismark brown, indigotin, methylene blue and indigo. Flexible ivory is prepd. by immersion in H_3PO_4 , d. 1.130, until almost transparent, rinsing and drying. Flexible ivory is dyed with alc. solns. of dyestuffs. CHAS. E. MULLIN

Dyeing machines with special reference to dyeing wool tops. HENRY CLAPHAM. *Am. Dyestuff Rept.* 12, 354-62(1923).—An address. L. W. RIGGS

Carpet yarn dyeing. L. J. MATOS. *Am. Dyestuff Rept.* 12, 369-70(1923); cf. *C. A.* 17, 1150.—The details of carpet dyeing are described. L. W. RIGGS

Dyeing and printing aniline black on mixed cotton and silk piece goods. RAFFAELLE SANSONE. *Textile Colorist* 44, 229-30, 369-71, 503-5, 596, 796-9(1922); 45, 160-2(1923); (cf. *C. A.* 17, 2506).—Formulas and instructions for many processes are given with a discussion of the app. required, relative advantages of the various methods, suggestions, etc. CHAS. E. MULLIN

Operations preliminary to dyeing mixtures of wool and silk. GEORGE EMMONS. *Am. Dyestuff Rept.* 12, 348-50, 363(1923).—The characteristics of wool and silk are described and an outline of directions for preparatory treatment, steaming, scouring and bleaching is given. **Bleaching silk.** *Ibid* 382-4, 409.—Directions are given for bleaching silk with H_2O_2 , and with Na_2O_2 . Bleaching with SO_2 is objectionable because the color returns and any trace of SO_2 remaining in the fiber interferes with subsequent dyeing. L. W. RIGGS

Lime and cotton. WM. B. NANSON. *Textile Am.* 39, No. 1, 27-8, 61-4; No. 2, 22-4; No. 3, 21-2, 61, 67, 70(1923); cf. *C. A.* 17, 1153.—On the uses of $\text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2$, CaC_2O_4 , CaCO_3 , $\text{Ca}(\text{OCl})_2$, CaCl_2 , CaSO_4 , $\text{Ca}(\text{CNS})_2$, and Ca lignosulfinate in bleaching, dyeing, printing, waterproofing, sizing and finishing. CHAS. E. MULLIN

The chromates of lead in dyeing. III. WM. B. NANSON. *Textile Am.* 39, No. 6, 31-3(1923); cf. *C. A.* 17, 638, 1150. CHAS. E. MULLIN

Discharges on cotton cloth. RAFFAELLE SANSONE. *Textile World* 63, 3486-9(1923).—Formulas are given for white and colored discharge pastes from SnCl_4 , hypo; sulfite, Zn dust and Al dust. CHAS. E. MULLIN

Scroop on cotton or woollen fabrics. WM. B. NANSON. *Textile Am.* 39, No. 5, 57-8(1923).—Cotton is scrooped by soaping and then treating with dil. mineral acid

or a soln. contg. either 5 g. lactic acid and 15 g. $\text{NaC}_2\text{H}_3\text{O}_2$ or, 5 g. tartaric acid and 2.5 g. $\text{Na}_2\text{C}_4\text{H}_4\text{O}_6$ per l. Wool is scrooped by chloring more strongly than in the unshrinkable process, soaping and scouring with AcOH . CHAS. E. MULLIN

Chemical engineering in the production of coated fabrics. S. D. KIRKPATRICK. *Chem. Met. Eng.* 28, 1017-23(1923).—A well illustrated description of the manuf. of artificial leather and rubberized cloth as carried out by the Duratex Corp., Newark, N. J. The chief raw material in each class is the cloth, which may be duck, twill, drilling, sateen, moleskin, lawn or sheeting. The pyroxylin is furnished in a 12% soln. of nitrocellulose in a mixt. of solvents consisting of a diluent, a latent solvent, and the true solvent. The latter is generally AcOEt , the latent solvent denatured alc., and the diluents C_6H_6 and C_7H_8 . In the rubber dept. sheeted rubber and solvent are churned in a mixer until the desired smoothness and viscosity have been obtained. The pasty rubber cement is drawn from the bottom of the mixer into tubs. Unusual features of the power plant are pointed out. W. H. BOYNTON

Effects of treating and outdoor exposure upon water resistance and tensile strength of cotton duck. T. D. JARRELL AND H. P. HOLMAN. *Ind. Eng. Chem.* 15, 607-10 (1923).—More than 80 tests were made on duck treated and untreated, with and without the addn. of pigments to the waterproofing material. In general the addn. of pigments to waterproofing materials is beneficial, as they reduce the deteriorating effect of sunlight without interfering with the water resistance. L. W. RIGGS

Carbonizing with aluminium chloride. R. O. FERNANDEZ. *Am. Dyestuff Rept.* 12, 389-92(1923). Carbonizing dress goods with aluminium chloride. FRANK BIERY. *Ibid.* 392. Carbonizing worsted piece goods. M. R. MOFFAT. *Ibid.* 392-3.—Details of the processes are given with a report of the discussion of the papers by the members of the New England Section of the Am. Assoc. Text. Chemists and Colorists. L. W. R.

A comparison of the volatile products derived from cotton by the action of water and of sodium hydroxide at forty lbs. pressure. P. H. CLIFFORD AND R. G. FARGHER. *J. Text. Inst.* 14, 117-24T(1923).—The volatile products are formed in such a small quantity that distillates were obtained from the action of H_2O and NaOH on several tons of American cotton, under works conditions approximating to those obtaining in lab. expts., with an autoclave. *Volatile products sol. in H_2O .*—Distn. with 2% NaOH yielded principally CH_3OH and $(\text{CH}_3)_2\text{CO}$, together with small quantities of a substance giving a *p*-nitrophenylhydrazone m. 210° , and traces of other substances forming unstable *p*-nitrophenylhydrazones. Distn. with H_2O gave CH_3CHO , $(\text{CH}_3)_2\text{CO}$, traces of an aldehyde or ketone giving a *p*-nitrophenylhydrazone m. $109-110^\circ$, and small quantities of substances which formed unstable *p*-nitrophenylhydrazones, and failed to give cryst. derivs. with hydroxylamine, semicarbazide or phenylhydrazine. The isolation of CH_3OH and $(\text{CH}_3)_2\text{CO}$ strengthens the evidence for the presence of pectin in cotton. The aq. ext. [distillate] yields a substance resembling pectin, from which CH_3OH and $(\text{CH}_3)_2\text{CO}$ were evolved on treatment with alkali. *Volatile products immiscible with H_2O .*—This portion of the distillate was a pale yellow liquid of camphoraceous odor, which darkened rapidly on exposure to air and tended to resinify on distn. with steam or under diminished pressure. It was sepd. by distn. in steam into 2 fractions, the less volatile consisting of an aldehyde or ketone, $\text{C}_{10}\text{H}_{18}\text{O}$, characterized by the prepn. of the semicarbazone. The more volatile fraction, with a formula $\text{C}_{15}\text{H}_{28}\text{O}$ or $\text{C}_{15}\text{H}_{26}\text{O}$, proved unreactive towards the usual reagents for the identification of alcohols, aldehydes, or ketones. *Volatile bases.*—Distn. with NaOH yielded NH_3 , $(\text{CH}_3)_2\text{NH}$, $(\text{CH}_3)_3\text{N}$, pyrrole or a deriv. yielding pyrrole. Distn. with H_2O yielded similar bases but in much smaller amts. L. W. RIGGS

Moisture relations of colloids [shrinkage of wool] (FISHER) 2. Fireproofing of wood and cloth for theater scenery (HANRIOT, *et al.*) 18. Dyes of the aurin type (BAINES, DRIVER) 10. Apparatus for waterproofing paper or cloth (Japan. pat. 41,399) 23.

Viscose artificial silk. E. BRONNERT. U. S. 1,458,399, June 12. Threads of below six deniers are prepd. by forcing viscose through openings of a diam. considerably larger than the diam. of the thread desired in the case of viscose of normal fluidity, into a bath contg. H_2SO_4 , $(\text{NH}_4)_2\text{SO}_4$ and Na_2SO_4 . The minimum concn. of the acid component of the bath is inversely proportional to the square root of the denier numbers of the thread desired and the amt. of acid per unit vol. of the bath (calcd. $(\text{NH}_4)_2\text{SO}_4$ as equiv. to half its wt. of H_2SO_4) is maintained at least up to a certain minimum wt. which is experimentally detd. for each denier number. Cf. C. A. 16, 2784.

26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

Limitations of the obscuring-power method of determining the particle size of pigments. E. B. SPEAR AND H. A. ENDRES. *Ind. Eng. Chem.* **15**, 725-6(1923).—A critical study of the obscuring-power method for detg. relative av. particle size of pigments (cf. Vogt, *C. A.* **16**, 2620; Lewis and Baker, **14**, 3160). The method is valuable for the examn. of different lots of pigments of the same compn. and cryst. structure which do not contain particles smaller than $0.1\ \mu$ in diam. It is not applicable for the comparison of two pigments whose n , light absorption and reflection, and other optical properties, are appreciably different. The particle size of all commercial pigments, except gas black and certain grades of ZnO , Sb_2S_3 and Fe_2O_3 , comes within the applicable limits of the method. The degree of dispersion of some pigments, obtained by previous methods, was incomplete; this may be remedied by addn. of tannin or gum arabic.

Lacquers which resist the action of weak acid solutions. ANDÉS. *Farben Ztg.* **28**, 1260-1(1923).—Chinese and Japanese lacquers, bakelite, shellac, etc., did not give as satisfactory acid-resistant coatings, as a black baking japan made from gilsonite, linseed oil and tar.

Light and color phenomena. W. A. MELCHER. *Textile Colorist* **45**, 219-22(1923).—A general discussion of some expts. upon the *aging of writing* with ink, in daylight, yellow, red and blue light, and in the dark. Daylight accelerates the darkening and later the fading of ink.

Aluminium stearate—its chemical and physical properties and use in the paint and varnish industries. H. A. GARDNER AND P. C. HOLDT. Paint Manufs. Assoc. of U. S., *Circ.* No. **182**, 247-64(June 1923).—Various physical and chem. tests on Al stearate for use in the paint and varnish industry, results of which are tabulated, suggest the following tentative specification: Must be finely divided, white, and contain not over 0.1% Fe_2O_3 , moisture, 1.5% (max.); H_2O -sol., 2.0% (max.); H_2O -insol. ash, 6.0% (min.); when 2 g. of the sample are dissolved in 50 g. xylene, a practically colorless and fairly clear soln. shall be obtained. An appendix by H. M. Johnson suggests in addition to the above: oleic acid, Al oleate, Na stearate, trace (max.); Al_2O_3 , 8.2 to 8.8%; stearic content, 91.5% (max.). Methods of making the specification tests, together with various jelly tests, etc., are given in detail. Illus.

South American resin. H. A. GARDNER. Paint Manufs. Assoc. of U. S., *Circ.* No. **183**, 269-71(June 1923).—A sample of *Jutahycica resin* from the jutahy tree, South America, was very hard, clear, and almost water white; acid no., direct method, 108.7, indirect method, 133. It resembles Congo or East India resin, is only partially sol. in turpentine, but after "running" becomes freely sol. Further tests in varnish making will be made. Consular report is appended. Illus.

Cellulose ether composition [as varnish] (U. S. pat. 1,458,256) **23**.

Paint. NAOHARU AOYAMA. Japan. 41,508, Jan. 25, 1922. A mixt. of 3.75 kg. of dolomite, burned at $700-800^\circ$ and powdered, 1.688 kg. of casein, and 3.75 kg. of clay is mixed for use, with 4.5 l. of H_2O . It forms a strong and H_2O -proof film.

Anticorrosive paint. KENZO HATTA AND THE NIPPON KWAKO KABUSHIKI KAISHA. Japan. 41,505, Jan. 25, 1922. Oil of turpentine or the like is added to a mixt. of 85 parts of drying oil, 100 parts of linoxyn, 25 parts of Pb palmitate, 15 parts each of Zn and Mn salts of fatty acids, 35 parts of a condensation product of Japanese lac, PhOH and HCHO and a suitable quantity of pigments.

Black ink. KEISUKE ONISHI. Japan. 41,414, Jan. 24, 1922. To a soln. of 2,625 g. of tannic acid, 262.5 g. of $K_2Cr_2O_7$, 52,500 g. of nigrosine and 375 g. of PhOH in 180.39 l. of H_2O , a suitable quantity of glycerol is added to form a fountain-pen ink.

Varnish. L. MAUERHOFER. U. S. 1,458,493, June 12. A varnish adapted for use on metals is prepd. from coal tar 75, benzene 18 and HNO_3 7%.

27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

Report on fats and oils. G. S. JAMIESON. *J. Assoc. Official Agr. Chem.* 6, 440-5 (1923).—The prepn. of the *Wijs soln.* is discussed, and it is recommended that the alternative method for its prepn. using ICl_3 be not adopted because it gives lower results. A study of the *Hanus method for detg. I no.* showed conclusively that no advantage is gained by allowing the soln. to react for 45 min. instead of 30 min. The modified Villavecchia method for the *detection of sesame oil in olive oil* was recommended to be made official as follows: Add 2 cc. of furfural to 100 cc. of 95% alc. by vol. and mix 0.1 cc. of this soln. with 10 cc. HCl (1.2) and 10 cc. of the oil to be tested by shaking them together for $\frac{1}{4}$ min. Allow mixt. to stand 10 min., observe color, add 10 cc. of H_2O , shake and again observe color. If the crimson color disappears sesame oil is not present.

E. SCHERUBEL

Hydrogenation. E. J. LUSH. *J. Soc. Chem. Ind.* 42, 219-25T(1923).—The activation of Ni surfaces was investigated by several methods: (1) Oxidation in air or O. By this means a thin film of oxide can be obtained with high temps. On subsequent reduction in H, Ni surfaces prepd. in this manner had no activity. (2) A film of Ni salt decompd. to oxide. Quite active catalysts can be prepd. using HNO_3 , AcOH and HCOOH can be used but their action on the metal is much slower and loss results from soln. of the metal. Ni turnings used in this way will contain about 1% of active surface Ni oxide, and, after reduction in H, will harden oil readily. This method has many objections in com. practice. (3) Anodic oxidation. By placing Ni turnings in an electrolyte of a 5% soln. of Na_2CO_3 and making them the anode, with a Ni sheet as cathode, it is possible by using suitable c. d. to oxidize rapidly the bright turnings to a deep black. After washing and reducing in H an active catalyst is produced. The thickness of the oxide film is of the order of the size of colloid particles, 0.00003 mm. To ascertain where in the activity lay, the activated surface was removed in several ways: by mech. agitation in oil; by washing the nitrate from the turnings before ignition; by reversing the current after anodic oxidation, thereby removing the black product. It was shown that the Ni had no activity on removal of the surface; the active surface collected separately was able to hydrogenate by itself, but its activity was much less than before removal from the turnings; the activity of the turnings decreased to 0 as the length of time the turnings were made the cathode increased. It is necessary if this method of hydrogenation is to become com. that exhausted turnings should be readily reactivated. This can be done by extrn. with trichloroethylene followed by anodic oxidation. The activity of the catalyst with edible cottonseed oil is very great; some was used steadily for 3 weeks without appreciable sign of poisoning.

E. SCHERUBEL

The fats of Indo China. CH. CREVOST AND CH. LEMARIE. *Bull. mat. grasses inst. Colonial Marseille* 1923, No. 3 and 4, 89-151.

E. SCHERUBEL

The manufacture of castor oil. J. H. SHRADER. *Trans. Am. Inst. Chem. Eng.* 12, Pt. 1, 121-7(1919).—A description of the methods and equipment developed at the U. S. Govt. plant at Gainesville, Fla., with its expeller system. The process has proved that (1) oil can probably be manufd. economically by the solvent process alone and (2) expellers are economical for large scale manuf.

C. C. DAVIS

Hydrogenation and dehydrogenation of castor oil and its derivatives. ANDRE BROCHET. *Bull. soc. chim.* 33, 626-32(1923).—See C. A. 17, 2198.

E. H.

Commercial utilization of the lipodiastase of the seed of the castor-oil plant. G. KITA. *Chimie et industrie* 9, 863-5(1923).—After a brief review, with references, of previous work, K. describes two processes: (1) Crush the decorticated seed in water, let stand or centrifuge to sep. coarser suspended particles, and add the proper amt. of a suitable acid. The activated diastase gradually rises to the surface of the liquid. (2) Grind the seeds, decorticated or not, mix with oil which has been hydrolyzed by the diastase, and strain through cloth to remove coarser particles. Wash 3 or 4 times with a large amt. of water, adding the suitable amt. of acid to the last wash water. The oil thus prepd. contains the activated diastase and is ready to be hydrolyzed. Numerical examples are given in each case. The glycerol water easily seps. from the fatty acids and it contains but small quantities of solids. Products of decompn. form a partial or total emulsion which can be broken by a Sharples supercentrifuge or by heating to boiling with 2% H_2SO_4 .

A. PAPINEAU-COUTURE

Medicated soaps. G. WOLFF. *Chem. techn. Ind.* 1922, 1133-5, 1149-51; *Chimie et industrie* 9, 976-7(1923).—A review of the use and prepn. of various types of medicated soaps.

A. PAPINEAU-COUTURE

Continuous presses for oil seeds. A. OLIER. *Bull. soc. encour. ind. nat.* 134, 725-7(1922).—The app. consists of a cylindrical casing 0.9 m. long and 0.12 m. in diam. It is made up of a series of steel bars whose distance apart can be adjusted according to the seeds to be treated. Inside of this casing of bars 2 horizontal shafts revolve at 2 different speeds. On each of these a screw is attached adapted to the seed which is hashed in an app. underneath the press and fed to the first screw which revolves the faster, from here it passes to the 2nd screw which is a prolongation of the 1st. The strongly pressed and very hot material leaves the app. on the opposite side through an opening enclosed by a cone which can be adjusted to leave more or less oil in the cake as desired. A press of this type handles 180 to 200 kg. per hr. and simplifies the operation, doing away with grinding, the placing of the seed in bags and putting in presses. The cake is violently ejected from the cone in the shape of conchoidal leaves, more cumbersome to sack but easier to grind. E. SCHERUBEL

Coquilho nuts. H. A. GARDNER. Paint Manufs. Assoc. of U. S., *Circ.* No. 180, 245-6(June 1923).—Coquilho nuts from *Allalea funifera* from Bahia, Brazil, resemble small coconuts but contain only very little meat with 65% oil of I no. 14, sapon. no. 261. The oil is entirely non-drying and appears to be similar to maripa palm oil from Brazil. Consular report is given. Illus. F. A. WERTZ

Wool scouring wastes. C. S. PALMER. *Trans. Am. Inst. Chem. Eng.* 12, Pt. I, 113-9(1919).—An outline of the forthcoming investigation of the U. S. Bureau of Chemistry, which comprises (1) the recovery and uses of "wool grease"; (2) recovery of K compds.; (3) recovery of soap wastes; (4) recovery of fertilizer material and (5) clarification of the final effluents from the point of view of sewage purification. Properties of wool grease, little known though not new (cf. Donath and Margosches, *Das Wollfett*, in Ahrens, *Sammlung chemischer und chemisch-technischer Vorträge* 6, 39(1901)) are included (cf. C. A. 13, 1940). C. C. DAVIS

Preparation and utilization of crude and refined wool grease. MAURICE DE KEGHEL. *Rev. chim. ind.* 31, 293-6, 323-7(1922); 32, 53-8(1923).—A review. A. PAPINEAU-COUTURE

Soaps and proteins (FISCHER, *et al.*) 11A.

TEHRSAM, R.: **La fabrication des savons industriels emulsions pour l'ensimage, et huiles solubles.** 2nd Ed. revised and enlarged. Paris: Dunod. 305 pp. 30 fr. 50.

Rendering apparatus. C. OFFENHAUSER. U. S. 1,458,722, June 12. An app. for rendering animal materials to ext. oils or fats comprises a S burner, a device in which the gases from the burner are sprayed with H₂O, a collection tank for sulfurous soln. thus formed and a digester which is supplied with the soln. and with steam.

28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

Progress made in sugar manufacture and by-product utilization in Hawaii. ANON. *Intern. Sugar J.* 25, 85-8(1923).—Report of Committee on Manuf. of Sugar and By-products Utilization, Hawaiian Sugar Planters Assoc. Preliminary studies of the efficiency of present methods of clarification upon the refining value of raw sugars have been completed. No change has been made in the system of boiling low-grade products. The quality of the raw sugars made during 1922 was inferior to that of previous years. The characteristics of Hawaiian sugars which make them difficult to refine are ash, sulfate content and slow filterability. The investigation of the utilization of by-products consisted in a study of the factors detg. the profits to be derived from the manuf. of fuel and motor alc. from final molasses. It was concluded that alc. could not profitably compete with gasoline at 25 c. and kerosene at 17 c. a gal. Cf. C. A. 17, 1105. W. L. OWEN

Experimental work in the Hawaiian Islands. ANON. *Intern. Sugar J.* 25, 122-3(1923).—Ann. Rept. of the director of the Hawaiian Sugar Planters Expt. Station. The rept. consists of a discussion of cane, diseases, insect pests, reforestation work, and soil studies. No deleterious effects have resulted from the continued use of saline waters for irrigation. Nitrates are retained in the second and third foot of soil, and no great loss occurs in the ordinary system of cropping. The citric acid-sol. phosphate of soils studied varied from 0.0009 to 0.319%. Response to phosphate treatment

occurred in soils contg. from 0.0009 to 0.0027 but none from those contg. from 0.0026 to 0.319. The acidity of the responding soils varied from 4.6 to 6.3, and of the unresponding soils from 6.1 to 8.2. Both lime and silica were more sol. in the unresponding soils.

The sugar industry in Mauritius. ANON. *Intern. Sugar J.* **25**, 76(1923).

W. L. OWEN

Progress in the sugar industry in India. ANON. *Intern. Sugar J.* **25**, 12-3 (1923).

W. L. OWEN

Fuel economy in the sugar factory. E. SOMMIER. *Bull. soc. encour. ind. nat.* **135**, 196-204(1923).—Coal now represents 25% of the total factory expense. The old type factory often loses 10-11 kg. steam out of a total of 84 kg. per 100 kg. of beets. The max. total coal consumption is 105 kg. per ton of beets. This could be reduced to 60 kg., distributed as shown in a table, by installing tubular heaters with rapid circulation; by using steam of higher temp. for the effects, sending the condensed waters of the first body back to the boilers, and using that from the others for heating juices, etc., by the countercurrent system; by using the furnace gases for drying the pulp. The coal consumption could be further reduced to 55 kg., by the use of vapor compressors, and perhaps even to 48 kg., if it were possible to work without condensers. Perfect insulation of pipes, etc., is indispensable. Similar economies as those given can be effected in the refinery.

F. W. ZERBAN

Note on steam economy in the sugar industry. E. CARON. *Bull. soc. encour. ind. nat.* **135**, 204-9(1923).—In the factories producing only beet juice, the exhaust steam of the machines now largely goes to waste. This loss may be overcome by the central factory furnishing part of the necessary motive power to the juice extn. plant, or else the surplus exhaust may be utilized for partial evapn. of the juice. In sugar factories proper, heat is lost in the condensed and in surplus hot water. Under the conditions existing before the war this could not be entirely avoided. But now that high pressure and superheated steam are used to a greater extent, the use of vapor compression may be expected to extend also. Either rotary compressors may be employed, giving 52% of the theoretical effect, or else ejectors, which are only 25% efficient, but often preferable on account of their simplicity. It will be necessary to increase the initial steam pressure and keep the exhaust at 118-9°. The hot waters can be utilized in heaters using the countercurrent system. By these measures the coal consumption per ton of beets may be reduced to 50 kg.

F. W. ZERBAN

The cause of the caking of raw sugars. W. F. V. H. DUKER. *Intern. Sugar J.* **25**, 131-2(1923).—Rept. of Committee on Manuf. of Sugar and Utilization of By-products, Hawaiian Sugar Planters Assoc. The caking of raw sugars has been attributed to (1) the action of gums in the cane, (2) the crystn. of the sucrose in the molasses films, which cements the grains together, (3) bagging the sugar at too high a temp., (4) excessive concn. of the molasses films, (5) low moisture content of sugars. The recommendations for the elimination of the trouble are a more thorough cooling before bagging, the use of more water for washing, so as to reduce the density of the molasses, and cooling the sugar while in motion. Alk. sugars are believed to be less subject to caking than acid sugars.

W. L. OWEN

Caking of sugars. E. WUTHRICH. *Intern. Sugar J.* **25**, 192-5(1923); cf. preceding abstract.—The caking of raw sugars is attributed to (1) moisture, (2) quality, (3) process of manuf., (4) temp. at time of bagging, (5) weather and climatic conditions, (6) conditions of transportation, and type of storage buildings. The following conclusions are drawn from a series of expts. Sugars with a high moisture content invariably cake upon drying out, which may occur when the atm. is humid. This is the principle employed in the manuf. of brick sugar. Sugars of low moisture content, 0.3-0.4%, will not cake, regardless of the temp. of bagging, if they do not absorb moisture and later dry out. If sugars are abnormally viscous or sticky they will cake irrespective of moisture content. The remedy consists in better clarification, production of uniform grain of reasonable size, proper centrifugalizing, drying, cooling, transporting and storing.

W. L. OWEN

Comparisons of efficiency and costs in bone char and decolorizing carbon refineries. GEORGE AVOT. *Intern. Sugar J.* **25**, 196-8(1923); cf. *C. A.* **17**, 1730.—Vegetable carbons are 42 times as efficient as bone char for decolorization. With bone char at \$0.05 per lb. carbons can reach a price of 40 cents and still compete. The market price of the latter usually ranges from \$0.15 to \$0.20 per lb. Bone char removes more ash than vegetable carbons; sugars made by the two processes show an av. of 0.12-0.15% ash for bone char and 0.18-0.20% for vegetable carbon. Other advantages of the vegetable-carbon process of refining are given.

W. L. OWEN

Surplus bagasse: C. J. H. PENNING. *Intern. Sugar J.* 25, 185-91(1923).—The accumulation of bagasse in excess of the fuel requirements of the factory shows that the mech. operations are favorable. The conditions conducive to this result are: (1) a fiber content of over 10%, (2) efficient furnaces, (3) an efficient steam-generating plant, (4) the use of economic prime movers in the factory, (5) economic layout of steam lines, and proper insulation of same, (6) continuous operation of crushing plant. It is often advisable to mix cane high in fiber with that low in fiber for milling. The advantages of various types of bagasse feeders are discussed. Attention should be paid to the analysis of flue gases, to insure the proper combustion in furnaces. In the Philippines surplus bagasse is the rule rather than the exception. Extensive expts. have been made in Java on the use of surplus bagasse. Baled bagasse has been used successfully as fuel for plantation locomotives. It cannot be so used as it comes from the mill, but after 3 weeks storage it proves an efficient fuel. W. L. OWEN

The coloring matter of molasses. WALTER POLLAK AND M. KNOB. *Brennereizig.* 39, 39-40; *Chem. Zentr.* 1923, II, 38.—The color of molasses is due to compds. of the humic acid type. They are formed from acids in the solns. of albumin or from carbohydrates, NH_3 and other compds. contg. N through addn. of NH_2 groups. $\text{Al}(\text{OH})_3$ is the best reagent for clarification. In general oxidizing agents fail to work, with the exception of KMnO_4 whose activity depends upon the formation of flocculent MnO_2 . The coloring matter shows strong reducing power. The clarifying effect of H_2SO_4 is much overestimated. Alk. compds. prevent clarification. For detg. the color, a standard soln. is prepd. by adding to 50 cc. H_2O 230 drops of raw sugar soln. (26.048 g. raw sugar in 200 cc. H_2O). The other samples are standardized against it by adding to 50 cc. of reagent (H_2O_2 , H_2SO_4 , H_2SO_4 , KClO_3 , KMnO_4 , etc.) sufficient drops of the soln. to be tested to make the standard and the exptl. sample the same tint. C. C. DAVIS

Tables for the determination of color of sugar solutions by means of the Stammer colorimeter. JOSEPH HAMOUS. *Z. Zuckerind. czechoslovak Rep.* 46, 686-90; *Chem. Zentr.* 1923, II, 37.—Based on the formula $10,000/(\text{hst})$ derived by Sazavsky (cf. *Z. Zuckerind. czechoslovak Rep.* 45, 299), 2 tables are calcd. for liquors of 50-68° and 10-24.5° Bé. C. C. DAVIS

Water adhesion and surface area of headed sugar beets with respect to the dampness correction in the weighing of beets. FERDINAND KRYZ. *Z. Zuckerind. czechoslovak Rep.* 46, 679-84; *Chem. Zentr.* 1923, II, 36.—It is not justifiable to make a const. deduction of 1-2% in wt. for absorbed H_2O , since the condition of the beets varies greatly in the individual crops. C. C. DAVIS

The science of the clarification of cane juice. H. EGETER. *Intern. Sugar J.* 25, 133-5(1923); cf. *C. A.* 17, 1557. W. L. OWEN

Some further notes on milling plant performance estimations. P. H. PARR. *Intern. Sugar J.* 25, 68-9(1923).—Some additional tables are given for cane of 16, 18 and 20% fiber content, for single and compound imbibition. Cf. *C. A.* 16, 3409. W. L. OWEN

Starch in sorghum juice. S. F. SHERWOOD. *Ind. Eng. Chem.* 15, 727-8(1923).—Analyses are given of the juice of 15 varieties of sweet sorghum, showing 13.85-21.5% solids, 6.86-15.75% sucrose, 0.60-5.99% reducing sugars, and 0.142-0.852, av. 0.366%, starch. The starch was detd. by settling the preserved juice for several months, dialyzing the ppt. in small collodion sacks, and hydrolyzing with diastase. High starch content of the juice goes hand in hand with high sucrose and low reducing sugars. Starch is probably responsible for the "jellying" of certain sorghum sirups, and for the difficulties in filtering sorghum juice. F. W. ZERBAN

The salt hydrolysis of starches. I. W. BIERDERMANN. *Biochem. Z.* 135, 282-92 (1923).—A soln. of potato starch (1%) is heated to 80° and covered with toluene. Five cc. portions are mixed with 5 cc. of various solns.: (a) distd. H_2O , (b) 0.3 g. NaH_2PO_4 plus 0.8 g. Na_2HPO_4 plus 0.5 g. NaCl in 100 cc. H_2O , (c) 1% NaCl , (d) 0.05% glycine in c, (e) 0.05% glycine in (b), (f) 0.05% glycine. The mixts. are heated to boiling, cooled, shaken with air for 15 min. and the time necessary to reach the achromic point is detd. e is most effective (2 hrs.); d next; b 3 hrs.; and a after a longer time. a and b produce no change. The time is greatly prolonged if aeration is omitted. Sol. starches from other sources give similar results. The effect of glycine, accentuated, was shown in previous expts. with trypsin digests and starch (*C. A.* 17, 564). The results lead to the following generalization: Of all the components of a system which apparently contains a diastatic enzyme, only the inorg. salt or its ions are able, in association with O, to break down starch with the formation of sugar. The org. compds. are unable to effect this unless salts and O are present. GEORGE ERIC SIMPSON

Production of alcohol from nipa palms (EATON, DENNETT) 16. The vapor pressures of concentrated sugar solutions (PERMAN, SAUNDERS) 2.

29—LEATHER AND GLUE

ALLEN ROGERS

The problem of securing weight in sole leather. E. ANDREIS. *Halle aux Cuirs* No. 4, 97-107(1923).—All the operations of the tannery are discussed from the point of view of their effect upon the weight of the final product. Loss of hide substance during soaking and unhairing should be kept down to a min. Details of retanning processes are given. Bleaching is described, with special reference to avoiding removal of material deposited during retannage. H. B. MERRILL

The soaking and liming of hides. C. M. MORRISON. *J. Am. Leather Chem. Assoc.* 16, 345-9(1921).—A review. W. H. BOYNTON

Tanning in vacuum. ALBERT AF FORSEELLES. *Gerber* 49, 43-5(1923).—Designs are given for a new app. for vacuum tanning. A time saving of 50% is claimed, the leather produced having the same compn. and quality as that produced by the usual process. H. B. MERRILL

Electric tanning. ANON. *Rev. electrochim.*, Jan. 1922; *Rev. chim. ind.* 31, 361(1922).—The tanning bath should have a sp. gr. of 2° Bé. The vats contain electrodes protected by means of diaphragms. With 30 hides and a current of 90-110 amps. at 110 v., tanning is complete in 20-30 hrs. If the current is passed for only 8 hrs., the hides are then ready for rapid tanning by one of the usual processes, the current consumption being 4-9 kw. for 5 m.² of hide. Electrically tanned leather is supple and light in color. A. PAPINEAU-COUTURE

The action of tanning materials on hide substance at boiling temperature. W. MOELLER. *Z. Leder-Gerberei-Chem.* 2, 142-9(1923).—Practically hides cannot be tanned at temps. above 40° because of the hydrolysis of the untanned portion. In a series of expts. 1-g. portions of hide powder were put into 100 cc. of 5% solns. of tanning exts., boiled for 13 hrs. under a reflux condenser, after which detns. were made of dissolved N. Increasing amts. of N were dissolved by the exts. in the following order: quebracho, chromic sulfate, neradol, HCHO, β -naphtholsulfonic acid. E. J. KERN

Viscosity of tanning extracts. LEOPOLD POLLAK. *Z. Leder-Gerberei-Chem.* 2, 121-30(1923).—At const. sp. gr., maintained by increasing the concn., rise of temp. caused a decrease in viscosity of tanning exts. At const. temp. an increase in sp. gr. caused an increase in viscosity. At a sp. gr. of 25° Bé. and a temp. of 25° viscosities decreased in the order: quebracho, tizera, pine, wattle, oak wood, chestnut wood. It is thought that an ext. of high sp. gr. and viscosity will produce greater wt. in leather and that it should be used at as high a temp. as possible so as not to retard the rate of diffusion. E. J. KERN

Artificial drying of leather. M. HIRSCH. *Halle aux Cuirs* No. 2, 41-6(1923).—The leather is dried by air at 40°. The relative efficiency of different arrangements of air inlets in the drying chambers is discussed. H. B. MERRILL

The time factor in the effect of sulfuric acid on leather. HANS BÜTTNER. *Z. Leder-Gerberei-Chem.* 2, 131-5(1923).—The destructive effect of added H₂SO₄ on fat-free leather increased up to 6 mo. and then decreased. Fat-liquored leather was attacked to a greater extent. The destructive action was measured by the increase in sol. nitrogenous products. E. J. KERN

The influence of temperature on the action of acid on leather. HANS BÜTTNER. *Z. Leder-Gerberei-Chem.* 2, 136-42(1923); cf. preceding abstract.—Added H₂SO₄ showed no greater destructive action on leather at 100° than at 50°, but the results obtained were erratic. E. J. KERN

Formaldehyde in the leather industry. GABRIEL DESMURS. *Halle aux Cuirs* No. 3, 71-9; *Hide and Leather* 65, 62-3(1923).—A review. H. B. MERRILL

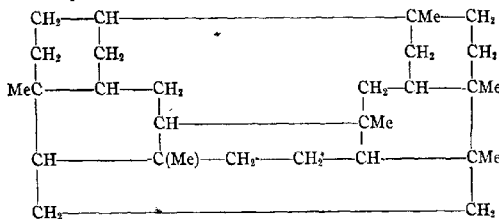
Chemical engineering in the production of coated fabrics (KIRKPATRICK) 25. Purification of waste waters by means of clay (CARRE) 14.

Soft leather. TOMOKICHI OKAMOTO and SHINJIRO MATSUKANE. Japan. 41,455, Jan. 24, 1922. Tanned leather (100 parts) is treated with 25 parts of fermented beef brain dild. with 125 parts of warm H₂O in a rotating drum during 1 hr.; then it is treated with a soln. of Cr alum (5 parts), Na₂CO₃ (1.6 parts) in warm H₂O (600 parts) for 1 hr., washed with H₂O and dried. The product is soft and flexible.

30—RUBBER AND ALLIED SUBSTANCES

JOHN B. TUTTLE

The constitution of rubber. M. C. BOSWELL, A. HAMBLETON, R. R. PARKER AND R. R. McLAUGHLIN. *India Rubber J.* 64, 981-5 (1922); *Trans. Roy. Soc. Canada* 16, Sec. III, 27-47.—Failures to det. the constitutional formula of rubber are laid to a wrong choice of reactions, such as treatment with Br, O₃, HCl, etc., which carry depolymerization so far that the final products bear no simple relation to rubber. Several new reactions and derivs. are reported, and a new formula is proposed which is in harmony both with the new derivs. and with previously known reactions. From a survey of previous work, it is concluded that the dimethylcyclooctadiene formula of Harries is unsatisfactory because (1) the formation of 2 isoprene mols. would sever 2 single bonds in a mol. contg. 2 double bonds, which is unknown; (2) the formation of dipentene means an extensive intermol. change, not explainable except by an intermediate formation of isoprene with subsequent polymerization to dipentene; (3) if rubber contd. an ethylene linkage or any double bonds, a satd. compd. should be possible by addn. of H (cf. Pummerer and Burkard, *C. A.* 17, 898.—ABSTR.); (4) the formation of dihydronitrocinamic acid by the action of HNO₃ on rubber cannot be explained for a mol. contg. only dimethylcyclooctadiene, but is easily understood if dipentene is an integral part and (5) the synthetic grades of rubber of Harries are much more easily oxidized by O than natural rubber, probably because of the presence of ethylene linkages not present in natural rubber. A formula is proposed contg. dimethylcyclooctadiene, isoprene and dipentene as constituent parts, but with no ethylene linkages.



This should easily depolymerize to form derivs. of C₇H₈, C₁₀H₁₆, C₁₅H₂₄, C₂₀H₃₂, C₂₅H₄₀, etc., should give a final bromination product C₂₅H₄₀Br₂, a HCl addn. product C₂₅H₄₀HCl and should give O derivs. with O, H₂O₂ and KMnO₄. This formula also explains the easy formation of dipentene and of dihydronitrocinamic acid from A. The objection that O₃ forms an ozonide, the decompn. products of which exclude the possibility of any group but dimethylcyclooctadiene is invalid because the ozonide is proved by Olivier (cf. *C. A.* 16, 1237) not to be a homogenous compd. Rubber (extd. with Me₂CO), CCl₄, KMnO₄ and H₂O were shaken for 5 days at room temp. and after disappearance of the red color, filtered. The CCl₄ layer, concd., poured into MeOH, the ppt. washed with Me₂CO, EtOH and MeOH, dried *in vacuo* in the cold, and repurified in petr. ether and in C₆H₆ to remove all O-contg. solvents, gave the compound C₂₅H₄₀O, a dough, easily sol. in Et₂O, CCl₄, CHCl₃, C₆H₆ and CS₂ and insol. in EtOH, MeOH and Me₂CO, not attacked by cold acids and bases. It rapidly absorbed O on warming and slowly at room temp. to form the compound C₂₅H₄₀O₂. Rubber, CCl₄ and H₂O₂ soln. were shaken for 1 week at room temp., let stand 1 day and filtered. Evapn. of the H₂O layer gave a white sticky compd. which on drying rapidly absorbed O. This was not investigated further. The CCl₄ layer gave a transparent, bright yellow, hard compd., partially sol. in Et₂O. Extn. with Et₂O and pptn. with MeOH gave a white gummy mass, which filtered, washed with MeOH, EtOH and Me₂CO, dried, dissolved in Et₂O, filtered, pptd., washed and dried, gave the compound C₂₅H₄₀O. On heating to 100° it became partially insol. in Et₂O. After standing in the air, it was dissolved in Et₂O, filtered, pptd., washed and dried, giving the compound C₂₅H₄₀O₂, identical with that obtained from C₂₅H₄₀O on oxidation in the air (*loc. cit.*). These results indicated a C₂₀H₁₆ nucleus in the rubber mol. and C₂₅H₄₀O as the 1st oxidation product. This on loss of a central isoprene group became C₂₀H₁₆O and in place of this isoprene an O atom entered, giving C₂₅H₄₀O₂. The H₂O-sol. product was probably formed from the oxidation of this isoprene split off. In the formation of C₂₅H₄₀O by KMnO₄, a H₂O-sol. oxidation product

and CO_2 (5% by wt. of the rubber) were also formed. It is inferred that an isoprene group was oxidized by KMnO_4 to a H_2O -sol. acid and CO_2 . The Et_2O -insol. portion, dissolved in CCl_4 , pptd. by MeOH , washed, and dried *in vacuo* at room temp. gave the compound $\text{C}_{18}\text{H}_{26}\text{O}$, a sticky mass with a resin odor. Exposure of resin-free rubber in thin sheets to direct sunlight for 3 mos. gave an Me_2CO ext., 30% by wt. of the rubber. The resin, extd. with CS_2 , filtered, evapd., dissolved in Me_2CO , evapd. at room temp., pptd. with MeOH and dried, gave the compound $\text{C}_{20}\text{H}_{30}\text{O}_2$, a tough, rubbery mass. The resin insol. in CS_2 , shaken for 1 day with CS_2 , filtered, dissolved in Me_2CO , pptd. with MeOH and evapd. at room temp., gave the compound $\text{C}_{22}\text{H}_{40}\text{O}_3$, a hard, brittle, transparent mass. Rubber, CCl_4 , H_2O_2 soln. and I in CCl_4 were shaken for 2 weeks at room temp., let stand 1 day, filtered, washed with CCl_4 and dried in the air below 30° . The product, pulverized, washed with CCl_4 , dried, dissolved in EtOAc , filtered, the residue washed with EtOAc and dried, gave a light yellow solid for which no solvent could be found. The EtOAc soln. evapd. at room temp. with exclusion of sunlight, the residue partially dissolved in EtOAc , filtered, and evapd., gave the compound $\text{C}_{25}\text{H}_{40}\text{O}_3\text{I}$, a varnish-like solid grinding to a brown-yellow powder. Since I alone acts extremely slowly with rubber but rapidly with O , and since the final oxidation product by O was $\text{C}_{25}\text{H}_{40}\text{O}_3$, it is inferred that the I links the 5 isoprene groups in the $\text{C}_{25}\text{H}_{40}$ mol. by occupying a central position. Another O atom is united to the I by a single bond with a 2nd residue at the 2 O atoms, giving the unverified formula $\text{C}_{50}\text{H}_{80}\text{I}_2\text{O}_6$. C. C. DAVIS

